



The Chemical Company

December 15, 2006

FEDERAL EXPRESS # 8594 5522 2549

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Subject: BASF Corporation  
 EPA ID No. LAD 040776809, AI No. 2049  
 Activity#PER20000016  
*Response to LDEQ's Trial Burn Plan Notice of Deficiency*

Dear Mr. Sharafkhani:

In your letter dated October 16, 2006, the Louisiana Department of Environmental Quality (LDEQ) requested that BASF Corporation (BASF) address specific deficiencies that arose during their review of the Trial Burn Plan for Amines Boiler, Utility Boiler No. 3., and Utility Boiler No. 6, dated September 2006. The revised documents addressing LDEQ comments are being submitted with this letter. Information concerning the revisions is provided in the body of this letter.

The sections below use the same references as does LDEQ's letter. LDEQ's comments have been printed in italics and the corresponding responses from BASF are presented in bold print.

#### Trial Burn Report Comments

1. *The Trial Burn Plan must provide a calculation and numerical value of residence time for each of the units. Cross-sectional mechanical sketches of the boilers (with dimensions included) must be supplied to enable LDEQ to verify residence times.*

**A description of each boiler's residence time has been added to Section 4.4 of the Trial Burn Plan. The requested sketches have been added to Appendix B of the plan.**

2. *BASF is proposing minimum combustion chamber temperature limits for No. 3 and No. 6 Boilers of 1100 °F and 950 °F, respectively. LDEQ is concerned that temperatures of less than 1400 °F are indicative of insufficient heat being generated to destroy the waste, or of thermocouple placement that is unable to give an adequate indication of combustion chamber temperatures. The mechanical sketches to be provided in response to Comment No. 1 must show thermocouple locations. The facility must also provide an explanation of how the thermocouple readings are representative of*

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*actual combustion chamber temperatures and how the thermocouple readings respond to combustion temperature changes in a timely manner.*

The drawings indicating the location of the temperature measurement device on each boiler have been added to Appendix B.

In reviewing LDEQ's concern over the inability of acceptable waste destruction to occur at temperatures below 1,400 degrees Fahrenheit (°F), BASF evaluated information from the United States Environmental Protection Agency's (USEPA's) Hazardous Waste Combustor (HWC) National Emission Standards for Hazardous Air Pollutant (NESHAP) database. The HWC NESHAP emissions database contained source operating and emissions data for 75 hazardous waste burning liquid fuel boilers. Of these, 20 sources had information on the minimum combustion chamber temperatures that were demonstrated during the source's destruction and removal efficiency (DRE) tests. Eight of these sources documented minimum combustion chamber temperatures less than 1,400°F, and four had documented minimum combustion chamber temperatures less than 950°F. The majority of these sources were in USEPA Region 6. Of the eight sources with data collected at temperatures less than 1,400°F, only one demonstrated unacceptable DRE (< 99.99 percent). The source with poor DRE results was not one of the sources that demonstrated temperatures below 950°F. Further examination of the source with unacceptable DRE data indicates that they conducted their DRE demonstration with benzene. Benzene is known to be a "problem" principle organic hazardous constituent (POHC), as it is easily formed from other compounds during the combustion process. Therefore, it is possible that the poor DRE results are attributable to POHC selection rather than the combustion chamber temperature that was demonstrated.

In addition to researching information in the HWC NESHAP emissions database to support the proposed temperatures, we also conducted an evaluation into the feasibility of relocating the temperature measurement devices to a new location, per LDEQ's request. We examined both the effort and cost that would be involved to satisfy the request. Given the orientation of the tubes in the utility boilers, significant effort would need to be expended to complete the requested relocation, including removing multiple layers of the boiler wall (*i.e.*, outer plate, insulation, support structure, inner plate), removing sections from six of the tangential boiler tubes and the surrounding refractory, installing the thermocouple fittings and reinstalling removed refractory, reconfiguring of affected boiler tubes, and satisfying various safety inspections (*i.e.*, x-ray testing, hydrostatic pressure testing). This work would require about seven days of downtime per boiler during which time the acetylene off-gas that is fed to Utility Boiler No. 3 would have no outlet, resulting in a curtailment of operations at the Acetylene unit. The

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Acetylene unit feeds other production units at the Geismar Plant, and curtailment of its operations would have a trickle-down effect, reducing production capability of at least four other operating units. The anticipated costs for the thermocouple relocation are expected to exceed \$120,000 per boiler. This reflects only the costs of the actual work effort associated with the relocation and does not capture the significant revenue that would be lost due to the associated curtailment of facility process units that would need to occur during the seven-day boiler outage.

As a result of our data review, we feel that the combustion chamber temperatures selected for our DRE demonstration on these boilers are reasonable, considering temperatures that have been demonstrated on other hazardous waste burning liquid fuel boilers throughout USEPA Region 6. Additionally, we do not feel that relocation of the temperature measurement devices is appropriate considering the costs and efforts required to do so and the lack of a measurable benefit associated with the task. Should unacceptable DRE demonstrations be obtained, we will re-examine device placement and target conditions.

3. *Table 5-3 lists proposed Automatic Waste Feed Cutoff (AWFCO) limits that will be determined from Trial Burn results. This table is missing AWFCOs for carbon monoxide readings for each of the boilers and minimum and maximum steam production rates for Utility Boilers No. 3 and 6. The trigger limit for Utility Boiler No. 6 is given as 1,800 °F in this table; whereas, it is given as 950 °F in other locations in the plan. This discrepancy must be clarified. Also, a table of AWFCO setting during the Trial Burn Plan must be provided to ensure that proper safety measures are being utilized during the burn.*

We have added automatic waste feed cutoff (AWFCO) limits for carbon monoxide and minimum steam production rates as requested. We have not added an AWFCO limit for maximum steam production rate because we do not feel it is appropriate or justified. Our basis for this assertion stems from both the Boiler and Industrial Furnace (BIF) Technical Implementation Document (TID) and the HWC NESHAP technical support documents.

The BIF TID indicates that "a maximum production rate [limit] ensures that the device is feeding raw materials and nonhazardous fuels during the compliance test at rates that will not be exceeded after the test. This parameter ensures that the gas flow rate and particulate loading are maximized, which tests the ability of the PM collection system to control metals." BASF is establishing limits on both the maximum stack gas flow rate and the maximum ash feed rate. Because these parameters are being directly measured, we see no advantage in adding an additional, indirect measure of these same parameters. In fact, the HWC NESHAP specifically requires a facility to measure the maximum device

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production rate or the maximum flue gas flow rate (not both). The rationale behind this permitting philosophy is provided in the HWC NESHAP technical support documents. USEPA states that the maximum limit for "flue gas flowrate or another parameter (e.g., production rate)" must be specified "as an appropriate surrogate for gas residence time." USEPA explains that "the extent of organics destruction increases with increasing residence time [which is]...inversely proportional to gas flowrate...This limit [maximum flue gas flowrate or production rate] also serves to ensure that air pollution control equipment is not overloaded..." USEPA discusses various means by which the flue gas flowrate or production rate may be directly measured. They explain that "production rate could be indicated by measurement of parameters such as raw materials feed rate, thermal input, steam production rate (for boilers), or clinker production rate (for cement kilns)." They do specify, however, that "the parameter selected must directly [emphasis added] correlate with the flue gas flowrate." Again, BASF is establishing a limit on the maximum flue gas flowrate (as stack gas), therefore, we do not feel it is necessary to establish an additional limit which has the sole purpose of providing an indirect indication of the flue gas flowrate.

The trigger limit that was shown for Utility Boiler No. 6 was in error. The value has been corrected to correspond with all other data in the Trial Burn Plan.

As requested, we have also added a table to this section (Table 5-4) that presents proposed AWFCO limits for the Trial Burn period.

4. *The introduction of the Trial Burn Plan states that each boiler burns off-gases generated at the facility. A waste characterization of these vents (including constituents and their percentages) must be provided in the Trial Burn Plan. Also, the plan must state that vents will be routed to the unit being tested during Destruction and Removal Efficiency (DRE) testing.*

The requested information has been added to Section 3 of the Trial Burn Plan. Please note that vents are only fed to the Amines Boiler and Utility Boiler No. 3; no vents are fed to Utility Boiler No. 6.

5. *In Trial Burn Plan Sections 2.1.3 and 2.1.4., BASF suggests that minimum and maximum device production rates are not appropriate for the boilers. LDEQ does not agree with BASF's assessment. Therefore, minimum and maximum steam production rates for Utility Boilers #3 and #6 must be included in the Trial Burn Plan as required in LAC 33:V.3005.E.2.ii.*

We have added limits for the minimum steam production rates on Utility Boilers No. 3 and No. 6 to the Trial Burn Plan as requested.

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In regards to the maximum steam production rate that LDEQ has requested, we reviewed the referenced requirements in LAC 33:V.3005.E.2.ii. The introductory text to this particular citation (LAC 33:V.3005.E.2) discusses the DRE standard and the operating limits that should be associated with it. Specifically, LAC 33:V.3005.E.2 states "...for each such hazardous waste, the permit will specify acceptable operating limits, including the following conditions, as appropriate [emphasis added]." As we have discussed previously, we do not feel that a limit on the maximum steam production rate is appropriate for Utility Boiler No. 3 or No. 6 based on the other permit limits that we are establishing for these units. Please reference our response to Comment #3 for a more detailed discussion of this issue.

6. *BASF currently complies with metal and chlorine/chloride emission limits through Adjusted Tier I feed rates from the 2004 Recertification of Compliance (ROC). However, the Trial Burn Plan proposed to increase the stack gas flow rate and/or temperature for each of the boilers. Therefore, BASF must submit a revised model with the increased parameters to prove that the 2004 ROC feedrate limits comply with LAC 33:V.3005E.*

The stack gas flow rate and temperature values provided in the Trial Burn Plan are estimated based on engineering judgment. We do not feel it is appropriate to perform air modeling using these estimated values. Additionally, we believe that the conditions that will be demonstrated during the Trial Burn will result in better dispersion of pollutants than those demonstrated during the 2004 Recertification of Compliance (*i.e.*, higher flow rate and hotter plume will result in better dispersion). However, given that we cannot be certain of what the final demonstrated values will be until after the Trial Burn is completed, we defer judgment on this issue until after the Trial Burn. In the Trial Burn Report, we will review the demonstrated values and will compare them to those used in the previous air modeling. If we do not feel that the previous air modeling provides a conservative estimate of dispersion based on this comparison, we will re-run the air modeling at that time using the values demonstrated during the Trial Burn. Any necessary adjustments to the Adjusted Tier I feed rate limits will be presented in the Trial Burn Report.

7. *Data provided in Tables 3-1 through 3-3 must indicate a time period or number of samples used in the averaging of characteristic range. Also, the minimum range must be specified using a less than sign before the constituent detection limit.*

The descriptive paragraphs prior to each table provide information on the time period that was used to determine the typical characteristics presented in the tables

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(December 2002 through December 2005). We have also added a footnote to each table that reiterates this information.

The "NDs" previously presented in the tables to represent non-detect minimums have been replaced by approximate detection levels with less than signs.

8. *The waste characterization data for each feed stream (waste and fuel) must include the percentage of components and individual analytes. Without better knowledge of individual analytes and their abundance in the waste stream, it is impossible to determine whether Toluene is an appropriate choice for a Principal Organic Hazardous Constituent. Also, since Toluene is a Class 2 compounds on the thermal stability index, a restriction from burning any Class 1 compounds may be placed in the final modified permit.*

BASF has performed semivolatile and volatile organic analyses on the waste streams using USEPA SW-846 Methods 8260 and 8270. The results of all analyses were reported as non-detect. BASF has determined the potential organic components that may be present (and the concentration of those components) based on process knowledge. This information has been added to Section 3 of the Trial Burn Plan.

9. *Text in Figures 4-1 through 4-3 is not legible. The facility must resubmit figures with legible text.*

Section 4 has been reorganized. The referenced figures have been moved to the end of the section and have been resized to fit a full 8- $\frac{1}{2}$  x 11-inch page. The text should now be legible.

10. *Section 5-2 states that ash, chlorine, and metals federates will be determined through quarterly waste analysis. This is acceptable only if the quarterly analysis will be completed during The Trial Burn and one sample per feedstream including each of these constituents will be measured.*

BASF will coordinate their quarterly waste sampling with the trial burn. However, the results of the quarterly sampling will not be submitted in the Trial Burn Report. Only that data relevant to the Trial Burn demonstrations will be included in the report. Specifically, information on the higher heating value, specific gravity, ash, and POHC content of the wastes burned during the Trial Burn will be included in the report. All other data for these wastes, as well as the other wastes that are not burned during the Trial Burn, can be submitted under separate cover to LDEQ, if necessary.

11. *Section 6.7 of the Trial Burn Plan must include a calculation and explanation of the ash spiking rate.*

Section 6.7 has been revised to include the requested information.

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12. *The Trial Burn Operations section of the plan must describe how communication will be maintained by all parties to ensure that combustion operating limits, spiking rates, and sampling efforts are being coordinated.*

A brief discussion on the Project Coordinator's role relative to these topics has been added to the introductory text for this section. The reader is referred to the Quality Assurance Project Plan (QAPP) for a detailed discussion on roles and responsibilities and team communication lines. Clarification on the Project Coordinator's duties has been added to the QAPP.

13. *Section 7 (Sampling and Analysis Procedures) must describe and depict the location from which samples will be drawn. It must be clear whether or not the sample locations are before or after the addition point for spiking materials. If it is downstream from spiking locations, it must be far enough away to ensure complete mixing.*

The requested information has been added to Appendix B.

14. *Spiking materials must be sampled and archived in the event that their analysis is necessary.*

The requested sampling has been added to the test program. A description of the sampling is provided in Section 7.2.

15. *The LDEQ Trial Burn Report Format (found at <http://www.deq.louisiana.gov/portal/135/Default.aspx#reports>) must be used to submit Trial Burn Results.*

As requested, a reference to the specific location of LDEQ's Trial Burn Report Outline has been added to the Trial Burn Plan. A description of any anticipated deviations from this report outline has also been added to Section 8 of the Trial Burn Plan.

#### Quality Assurance Project Plan Comments

1. *The QAPP signature page must include a reference to the version of the QAPP that is being approved by the signer. Each person represented on the project organizational chart (Figure 2-1) must "sign-off" on the data results, including the field test coordinator. This signature needs to indicate the attainment of all quality assurance/quality control (QA/QC) expectations agreed to in the QAPP. If the data is determined to be invalid for whatever reason, it is essential that this be stated in the executive summary portion of the report, fully explained in the appropriate section of the report, and footnoted in any data summary tables.*

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The signature page has been modified to include the revision number of the QAPP as well as signature lines for all individuals identified in Figure 2-1. All of these individuals will participate in the appropriate portions of the test report development. Any deviations from sampling, analysis, or test operations will be detailed in the test report as requested.

2. *The plan states that carbon monoxide and oxygen will be monitored by existing continuous emission monitoring systems (CEMS) during the trial burn. The QAPP must include information on how data obtained by these CEMS will be accurate. At a minimum each CEMS must pass the Quarterly Calibration Error (CE) tests within four weeks of the Trial Burn, must have no unplanned maintenance between the CE and the Trial Burn, and must pass calibration drift test each day of testing during the Trial Burn. Quality assurance/quality control of the hydrocarbon monitor must also be discussed.*

Section 3.5 has been added to the QAPP to provide a discussion on the continuous emission monitoring systems (CEMS) that will be employed during the Trial Burn. Section 7.2 has been added to discuss the procedures that will be employed to ensure that the data obtained by these CEMS is accurate. Please note that, while we have added information on the total hydrocarbon CEMS to the QAPP, the data collected by this CEMS is not being used for RCRA compliance demonstrations and will not be included in the Trial Burn Report.

3. *LDEQ has developed a scope of duties for QAOs which can be found on our website at <http://www.dep.louisiana.gov/portal/Default.aspx?tabid=2378#qao>. Each of these duties and a signed acknowledgement of the QAO accepting these duties must be provided in the QAPP.*

A reference to the scope of duties specified for QAO's on LDEQ's website has been added to Section 2.7 of the QAPP. The signature page for the QAPP indicates "By signing, the signatories agree to the appropriate information pertaining to their project responsibilities provided in the QAPP." The QAO's signature on this page indicates their acceptance of the duties specified for them, including those specified in LDEQ's scope of duties.

4. *The Project Organization Chart must include the name of the STL Knoxville laboratory representative.*

The project organization chart has been modified as requested.

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5. *Section 3.4.1 (Sampling Point Determination) states that cyclonic flow will be checked once for each stack. Cyclonic flow must be checked once for each stack for each condition.*

Section 3.4.1 has been revised to indicate that cyclonic flow checks will be performed once per condition on each stack.

6. *Additional information must be provided to determine the number of sampling points for each stack. Please include all Method 1 parameters. Also, explain the discrepancy between Section 3.4.1 and Figure 3-6 on the number of sampling points to be taken in the Amines Boiler Stack.*

Section 3.4.1 has been updated as requested. USEPA Method 1 criteria for each of the sampling locations has been provided. Additionally, the error in the text regarding the sampling points on the Amines Boiler Stack has been corrected. The referenced figures have also been updated to make them easier to read.

7. *Section 3.4.6 of the QAPP must include a condition that Tenax® tubes for each test condition (including QC samples) must come from the same cleaning lot.*

The requested modification has been made to Section 3.4.6.

8. *Quality control objectives for stack gas samples should include a matrix spike and matrix spike duplicate per batch.*

Matrix spikes (MSs) and MS duplicates (MSDs) are typically not conducted on the volatile organic sampling train (VOST) samples. In order to do a true matrix spike, the laboratory would need to "split" one of the tube samples into three separate portions, one of which would remain unspiked and two of which would be spiked as the MS and MSD. Because it is not possible to "split" the tube samples, it is also not possible to conduct a MS/MSD analysis on the tubes. For the condensate samples, it is possible to conduct MS and MSD analyses. However, this analysis can not be completed without significantly raising the method detection limit (MDL) and reporting limit (RL) for the sample results. When trying to demonstrate acceptable destruction and removal efficiency (DRE) of a volatile organic compound, significant elevation of detection limits is reason for concern.

In lieu of conducting an MS and MSD on each sample tube, the laboratory analyses laboratory control samples (LCS) and LCS duplicates (LCSDs), as well as surrogate and internal standards. The LCS and LCSD samples are conducted using tenax cartridges that are from the same lot as those used during the test program. This, in a sense, does provide some evaluation of matrix effects. Additionally, the laboratory will also conduct

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an analysis of any VOST audit samples that LDEQ or USEPA wishes to provide. These quality control procedures, when combined, provide an assessment of both the precision and analysis of the analytical method, as well as an overall assessment of method performance.

Considering the difficulties and detriments associated with obtaining MS and MSD results for the VOST samples and the sufficiency of the other quality control practices that are employed, BASF does not feel it is appropriate to include MS and MSD analysis of the VOST samples.

9. *One field duplicate is required for each unit, not per trial burn as indicated on Table 6-1 and 6-3.*

Tables 6-1 and 6-3 have been modified to indicate that field duplicates will be conducted on a per unit basis.

10. *Attachment 3 (resumes of project team) is missing resumes for Kevin Woodcock (laboratory representative) and Dana Scott (test burn manager).*

The requested information has been added to the attachment.

11. *Attachment 4 includes a process sample field data sheet. Please explain the sample labeling.*

We have modified the sampling form to more clearly explain the sample labeling.

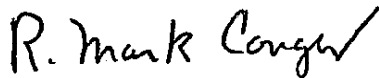
12. *The waste spiking equipment must be calibrated or the calibration must be checked before and after each spiking location.*

Section 7.4 has been modified to indicate that the equipment will be calibrated before and after the trial burn on each boiler.

If you have any questions or need further information, please call me at 225-339-7941. BASF is committed to providing whatever assistance is necessary to facilitate an expedited review of the revised Trial Burn Plan.

Sincerely,

BASF Corporation



R. Mark Conger, Ph.D.  
EHS Team Member

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# **Trial Burn Plan for Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6**

**BASF Corporation**

*Geismar, Louisiana*

**September 2006**

**Revision 1: December 2006**

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## **Trial Burn Plan for Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6**

**BASF Corporation**

*Geismar, Louisiana*

**September 2006**

**Revision 1: December 2006**



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00-69513.09

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## 1.4 Trial Burn Summary

The trial burn has been designed to demonstrate compliance with the RCRA PM and DRE performance standards. The program consists of one test condition for the Amines Boiler and two test conditions each for Utility Boiler No. 3 and Utility Boiler No. 6. Table 1-1 summarizes the trial burn demonstrations for each boiler.

**Table 1-1  
Trial Burn Condition Summary**

Boiler	Test Condition	Performance Standard Demonstration	Operating Limits Established
Amines Boiler	1	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
Utility Boiler No. 3	2A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum total hazardous waste feed rate
			Maximum stack gas flow rate
	2B	Destruction and removal efficiency	Minimum combustion chamber temperature
Utility Boiler No. 6	3A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
	3B	Destruction and removal efficiency	Minimum combustion chamber temperature

This trial burn is being coordinated by RMT, Inc. (RMT) under the direction of BASF personnel. RMT is responsible for the test protocol development and implementation and will oversee boiler operations and the stack sampling activities during the test program. METCO Environmental (METCO) will perform all of the stack sampling for the test program. METCO will be responsible for all emissions and process samples collected during the test program, with oversight by RMT. B3 Systems will provide waste spiking services during the test program. The emissions and process samples will be sent to the following laboratories for analysis: METCO and Severn Trent Laboratories, Inc. (STL). Dr. Robert Adams of METCO will act as the Quality Assurance Officer and will provide oversight of the stack sampling contractor during the testing. Additional information on the project team roles and responsibilities is provided in the Quality Assurance Project Plan (QAPP).

## 1.5 Preliminary Testing Summary

Prior to conducting the trial burns on the Utility Boilers, BASF plans to conduct preliminary testing to verify the test targets and emission levels. BASF anticipates that this testing will be conducted in January 2007. BASF will conduct the following testing during this *miniburn*:

- Two test runs for PM and DRE on Utility Boiler No. 3, while maximizing the total waste feed and ash feed rates and the stack gas flow rate (Condition 2A);
- Two test runs for DRE on Utility Boiler No. 3, while minimizing the combustion chamber temperature (Condition 2B);
- Two test runs for PM and DRE on Utility Boiler No. 6, while maximizing the total waste feed and ash feed rates and the stack gas flow rate (Condition 3A); and
- Two test runs for DRE on Utility Boiler No. 6, while minimizing the combustion chamber temperature (Condition 3B).

Because this testing will not be conducted for compliance purposes, only limited quality assurance and quality control (QA/QC) will be conducted on the stack gas samples. The QAPP will not be followed for the miniburn testing; the number of blanks and number and frequency of QA/QC samples will likely be reduced.

Target levels for the respective operating parameters will be consistent with those described in Section 6 of this plan. Accordingly, BASF is requesting that LDEQ approve the use of the alternative automatic waste feed cutoff limits described in Table 5-4 in lieu of those currently required by the facility's RCRA permit.

## 1.6 Test Plan Organization

This Plan has been prepared following the regulations codified in 40 CFR § 270.66 (LAC 33:V.535.A.1). The goal of the trial burn is to demonstrate that the boilers are operating in compliance with the RCRA emission standards. The remaining sections of the Plan provide the following information:

- Section 2 presents a discussion on the target operating parameter limits for the boilers;
- Section 3 presents information on the boilers' feedstreams;
- Section 4 presents a detailed engineering description of the boilers;
- Section 5 presents a description of the boilers' continuous monitoring systems;
- Section 6 presents a description of the test operating conditions;
- Section 7 presents a summary of the test sampling and analysis procedures;

- Section 8 presents a description of the Trial Burn Report;
- Appendix A includes the QAPP; and
- Appendix B includes engineering drawings.



## Section 2

# Operating Parameter Limits

BASF will demonstrate compliance with the RCRA DRE and PM performance standards and will establish permit conditions for the boilers during the trial burn. The expected permit conditions are based on guidance provided in the USEPA's handbook *Guidance on Setting Permit Conditions and Reporting Trial Burn Results*, January 1989, (EPA/625/6-89/019) and on the provisions of 40 CFR Part 266. The guidance document groups permitted parameters into three groups (A, B, and C). Group A parameters are those that are strictly based on trial burn results and which require continuous monitoring. Group B parameters are also based on trial burn results, but these parameters do not require continuous monitoring. Group C parameters are established based on equipment design and operating specifications and are not monitored continuously.

### 2.1 Operating Parameter Limit Demonstrations

During the trial burn, BASF intends to re-establish some operating parameter limits for the boilers. The target operating limits that BASF plans to demonstrate during the trial burn and the anticipated permit limits are discussed below and are summarized in Table 2-1.

Table 2-1  
Target Operating Parameter Limits

Operating Parameter	Target Value	Test Condition
<b>Amines Boiler</b>		
Maximum ash feed rate	2.0 lb/hr	1
Maximum stack gas flow rate	5,000 scfm	1
<b>Utility Boiler No. 3</b>		
Maximum ash feed rate	30 lb/hr	2A
Maximum total hazardous waste feed rate	25 gpm	2A
Maximum stack gas flow rate	65,000 scfm <sup>1</sup>	2A
Minimum combustion chamber temperature	1,100°F	2B
<b>Utility Boiler No. 6</b>		
Maximum ash feed rate	30 lb/hr	3A
Maximum stack gas flow rate	73,000 scfm <sup>1</sup>	3A
Minimum combustion chamber temperature	950°F	3B

<sup>1</sup> These target values are estimates that are subject to change prior to the trial burn. BASF will be installing monitors for these parameters prior to the testing. No historical data is available at this time to determine the appropriate target values. BASF intends to review operating data after the monitors are installed and may modify these target values.

### **2.1.1 Minimum Combustion Chamber Temperature**

A minimum combustion chamber temperature is established to demonstrate compliance with the organic emission standards of 40 CFR § 266.104 as appropriate.

40 CFR § 266.102(e)(2)(i)(E) requires that the minimum combustion chamber temperature limit be established on either an instantaneous basis or an hourly rolling average (HRA) basis. Combustion chamber temperature is a Group A parameter and is continuously monitored. BASF intends to demonstrate the minimum combustion chamber temperature for Utility Boiler No. 3 and Utility Boiler No. 6.

The minimum combustion chamber temperature for Utility Boiler No. 3 will be established in Condition 2B. The target value for combustion chamber temperature in Condition 2B is 1,100 degrees Fahrenheit (°F).

The minimum combustion chamber temperature for Utility Boiler No. 6 will be established in Condition 3B. The target value for combustion chamber temperature in Condition 3B is 950°F.

The minimum combustion chamber temperature limits will be established as HRAs using the average of the lowest HRA value for each run. The locations of the temperature measurement devices are depicted on drawings in Appendix B.

### **2.1.2 Maximum Total Hazardous Waste Feed Rate**

A maximum total hazardous waste feed rate must be established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104. 40 CFR § 266.102(e)(2)(i)(A) requires that the maximum total hazardous waste feed rate limit be established on either an instantaneous basis or an HRA basis. Maximum total hazardous waste feed rate is a Group A parameter and is continuously monitored. BASF intends to demonstrate the maximum total hazardous waste feed rate for Utility Boiler No. 3.

The maximum total hazardous waste feed rate for Utility Boiler No. 3 will be established in Condition 2A. The target value for total hazardous waste feed rate in Condition 2A is 285 gallons per minute (gpm). BASF will be modifying the burner systems of this boiler to achieve this new maximum feed rate.

### **2.1.3 Maximum Device Production Rate**

A maximum device production rate is established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104 and the PM emissions standard of 40 CFR § 266.105 as appropriate. 40 CFR §§ 266.102(e)(2)(i)(B) and (e)(3)(i)(B) require

that the maximum device production rate limit be established on either an instantaneous basis or an HRA basis. Maximum device production rate is a Group A parameter and is continuously monitored. BASF is proposing that a maximum device production rate limit is not necessary for the boilers.

In the 1997 DRE Trial Burn Plan for the Amines Boiler (dated January 15, 1997), BASF demonstrated that the maximum steam production rate is not an appropriate operating limit for the boiler because of the flue gas recycle. The flue gas recycle has an effect on the amount of steam produced in the boiler. Therefore, the steam production rate is not a good indicator of combustion conditions in the Amines Boiler. LDEQ agreed with this justification, and a limit on production rate was not established for the boiler.

BASF is proposing that a limit on steam production rate is also not appropriate for Utility Boiler No. 3 and Utility Boiler No. 6. For these boilers, BASF intends to establish a new limit on stack gas flow rate as an indicator of combustion gas velocity. BASF believes that this limit provides the necessary combustion control for the boilers. In the Utility Boilers, the steam production rate is directly proportional to the heat input of the boilers. There is no recycled flue gas in these units. The stack gas flow rate is also directly related to the heat input. These two parameters are essentially indirectly monitoring the same condition of the boiler – heat input. Therefore, BASF believes that it is not necessary to establish a limit for both parameters. A limit on stack gas flow rate will be sufficient to demonstrate proper operations of the combustion systems.

#### **2.1.4 Minimum Device Production Rate**

A minimum device production rate is established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104 as appropriate. 40 CFR § 266.102(e)(2)(i)(B) requires that the minimum device production rate limit be established on either an instantaneous basis or an HRA basis. Minimum device production rate is a Group A parameter and is continuously monitored. BASF is proposing that a minimum device production rate limit is not necessary for the boilers.

As with the maximum steam production rate, minimum steam production rate is not an appropriate indicator of performance for the Amines Boiler. As stated previously, the steam production rate is dependent on factors other than the combustion characteristics.

For the Utility Boilers, BASF believes that a minimum steam production rate limit is unnecessary. In these boilers, the condition that would result in minimum steam production would also result in the minimum combustion chamber temperature. BASF is proposing to establish minimum combustion chamber temperature limits for these

## 2.2 Permit Limits Summary

BASF intends to establish new operating parameter limits for the boilers during this trial burn. BASF also intends to retain some of the operating parameter limits that were established during the previous trial burns conducted in 1997. Table 2-2 lists all of the operating parameter limits that have been or will be demonstrated through testing for each of the boilers.

**Table 2-2**  
**Operating Parameter Limits Demonstrated Through Testing**

Operating Parameter	Group	Limit	Averaging Period	Demonstration
<i>Amines Boiler</i>				
Minimum oxidizer combustion chamber temperature	A	1,990°F	HRA	1997 Trial Burn
Minimum reoxidizer combustion chamber temperature	A	1,596°F	HRA	1997 Trial Burn
Maximum total hazardous waste feed rate	A	1,206 lb/hr	HRA	1997 Trial Burn
Maximum stack gas flow rate	A	5,000 scfm	HRA	New Trial Burn
Maximum ash feed rate	B	2.0 lb/hr	NA	New Trial Burn
Maximum chlorine/chloride feed rate	B	260 g/hr	NA	2004 Recertification of Compliance Test
Maximum metals feed rates Antimony Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Silver Thallium	B	195 g/hr 0.16 g/hr 31,500 g/hr 0.12 g/hr 0.17 g/hr 0.4 g/hr 54 g/hr 45 g/hr 1,900 g/hr 323 g/hr	NA	2004 Recertification of Compliance Test
<i>Utility Boiler No. 3</i>				
Minimum combustion chamber temperature	A	1,100°F	HRA	New Trial Burn
Maximum total hazardous waste feed rate	A	25 gpm	HRA	New Trial Burn
Maximum stack gas flow rate	A	65,000 scfm	HRA	New Trial Burn
Maximum ash feed rate	B	30 lb/hr	NA	New Trial Burn
Maximum chlorine/chloride feed rate	B	450 g/hr	NA	2004 Recertification of Compliance Test



## Section 3

# Waste Characterization

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All of the wastes burned in BASF's boilers originate from on-site production processes. The wastes are directly transferred from the on-site processes to the boilers. A brief description of the wastes processed in each boiler is provided in the sections that follow. More detailed descriptions of these waste streams can be found in the facility's *RCRA Part B Permit Application*.

The boilers have been designed to accommodate these feed streams in a safe and reliable manner. As the sections that follow demonstrate, the physical and chemical properties of the anticipated waste feed will vary. The waste feeds and spiking materials chosen for the trial burn have been carefully structured to demonstrate system performance within an established envelope that will provide operating flexibility to meet current and future needs, while complying with all environmental regulations.

### 3.1 Amines Boiler

The wastes that are burned in the Amines Boiler are generated from the production of a variety of specialty amines. These wastes are characteristically hazardous for ignitability (D001) and also may carry the F003 code. F003 wastes may include any of the following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol. These wastes are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash, chlorine, chromium, and nickel may be reported in the waste analyses. Table 3-1 provides information on the typical characteristics of the wastes that are fed to the Amines Boiler. The data provided on the wastes' physical parameters and the metals content is based upon waste analyses conducted between December 2002 and December 2005. Information provided on the organic components is based on process knowledge and is intended to provide a general idea of organics that may be present; it is not intended to be all encompassing.

**Table 3-1**  
**Summary of Typical Waste Characteristics for the Amines Boiler Wastes**

Parameter	Units	Range
Heating value <sup>1</sup>	Btu/lb	8,000 – 12,000
Total chlorine/chloride <sup>1</sup>	mg/kg	< 10 – 150
Ash <sup>1</sup>	mg/kg	< 100 – 1,500
<i>Metals: <sup>1</sup></i>		
Antimony	mg/kg	< 1
Arsenic	mg/kg	< 0.1
Barium	mg/kg	< 1
Beryllium	mg/kg	< 0.1
Cadmium	mg/kg	< 0.1
Chromium	mg/kg	< 0.2 – 2.5
Lead	mg/kg	< 1
Mercury	mg/kg	< 0.1
Silver	mg/kg	< 1
Thallium	mg/kg	< 1
<i>Organics: <sup>2</sup></i>		
Aniline	wt %	0 – 10
Cyclohexane	wt %	0 – 5
Dicyclohexylamine	wt %	0 – 20
Diethylene glycol	wt %	0 – 20
Dimethylamine	wt %	0 – 30
Dipropylene glycol	wt %	0 – 20
Ethanol	wt %	0 – 5
Isopropyl amine	wt %	0 – 10
Methanol	wt %	0 – 50
Methylmorpholine	wt %	0 – 30
Morpholine	wt %	0 – 20
Propylamine	wt %	0 – 30
Tertiary butanol	wt %	0 – 5
Tertiary butylamine	wt %	0 – 5
Triethylamine	wt %	0 – 5

<sup>1</sup> Based on data collected between December 2002 and December 2005.

<sup>2</sup> Based on process knowledge.

In addition to the wastes described above, BASF feeds non-hazardous vent streams to the Amines Boiler, including vents from the acetonitrile (ACN) process unit, reactor off-gas (VR), vacuum off-gas (VO), and main process off-gas (VM). Table 3-2 provides a characterization of

these vent streams. The data shown in the table is based upon vent sampling that was conducted in January 2006 and process knowledge.

**Table 3-2**  
**Summary of Typical Vent Characteristics for the Amines Boiler**

Parameter	Units	Measured Range <sup>1</sup>			
		ACN	VR	VO	VM
Acetonitrile	wt %	25	---	---	---
i-Butane	wt %	---	< 5	---	25
n-Butane	wt %	---	---	---	---
Carbon dioxide	wt %	---	< 0.1	< 1	< 0.1
Carbon monoxide	wt %	---	< 0.1	< 0.1	< 0.1
Ethane	wt %	---	< 1	---	< 0.1
Hexanes (plus higher order HC)	wt %	---	< 0.1	---	20
Hydrogen	wt %	---	30 - 35	---	< 0.1
Methane	wt %	---	0 - 5	---	---
Nitrogen	wt %	75	60 - 65	80	50
Oxygen	wt %	---	---	20	8
i-Pentane	wt %	---	---	---	---
n-Pentane	wt %	---	---	---	---
Propane	wt %	---	< 1	---	---

<sup>1</sup> Based on vent sampling conducted in January 2006 and process knowledge.

### 3.2 Utility Boiler No. 3

The wastes that are burned in Utility Boiler No. 3 are generated from the tetrahydrofuran (THF), Carboxy, Diols, and polytetrahydrofuran (PolyTHF) production units. These wastes are characteristically hazardous for ignitability (D001) and typically consist of methanol, PolyTHF, light-end hydrocarbons, isopropanol, and/or mixed alcohols. They are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash and chlorine may be reported in the waste analyses. Table 3-3 provides information on the typical characteristics of the wastes that are fed to Utility Boiler No. 3. The data provided on the wastes' physical parameters and the metals content is based upon waste analyses conducted between December 2002 and December 2005. Information provided on the organic components is based on process knowledge and is intended to provide a general idea of organics that may be present; it is not intended to be all encompassing.

**Table 3-3**  
**Summary of Typical Waste Characteristics for Utility Boiler No. 3 Wastes**

Parameter	Units	Range
Heating value <sup>1</sup>	Btu/lb	10,000 – 15,000
Total chlorine/chloride <sup>1</sup>	mg/kg	< 10 – 150
Ash <sup>1</sup>	mg/kg	< 100 – 2,000
<i>Metals: <sup>1</sup></i>		
Antimony	mg/kg	< 1
Arsenic	mg/kg	< 0.1
Barium	mg/kg	< 1
Beryllium	mg/kg	< 0.1
Cadmium	mg/kg	< 0.1
Chromium	mg/kg	< 0.2 – 2.5
Lead	mg/kg	< 1
Mercury	mg/kg	< 0.1
Silver	mg/kg	< 1
Thallium	mg/kg	< 1
<i>Organics: <sup>2</sup></i>		
Butanol	wt %	30 – 45
Butanediol	wt %	0 – 5
γ-Butylacetone	wt %	30 – 40
Ethanol	wt %	0 – 25
Hydroxyl butyl alcohol	wt %	5 – 10
Methanol	wt %	5 – 100
Methyl acetate	wt %	0 – 80
Propanol	wt %	20 – 30
Tetrahydrofuran	wt %	0 – 45
Toluenediamine isomers	wt %	0 – 100

<sup>1</sup> Based on data collected between December 2002 and December 2005.

<sup>2</sup> Based on process knowledge.

In addition to the wastes described above, BASF feeds a non-hazardous vent stream to Utility Boiler No. 3 that originates from the acetylene process unit. Table 3-4 provides a characterization of this vent stream, which is referred to as the acetylene off-gas vent (AO). The data shown in the table is based upon information recorded by the facility's process information management system (PIMS) on December 9, 2006. The information in the table presents a "snap-shot" of the vent characterization. On average, the vent stream is typically between 60 to

65 percent hydrogen, 30 percent carbon monoxide, and between five to ten percent by volume of the remaining components indicated in the table.

**Table 3-4**  
**Summary of Acetylene Off-Gas Vent Characteristics for Utility Boiler No. 3**

Parameter	Units	Value
Butane	vol %	0.003
Carbon dioxide	vol %	2
Carbon monoxide	vol %	30
Ethane	vol %	0.01
Ethylene	vol %	0.12
Hydrogen	vol %	60
Methane	vol %	5
Nitrogen	vol %	0.22
Oxygen	vol %	0.13
Propane	vol %	0.003

### 3.3 Utility Boiler No. 6

The wastes that are burned in Utility Boiler No. 6 are generated from the THF, toluene diisocyanate (TDI), Carboxy, Diols, and PolyTHF production units. These wastes are characteristically hazardous for ignitability (D001) and typically consist of methanol, PolyTHF, light-end hydrocarbons, isopropanol, mixed alcohols, and/or waste diamine vicinals. They are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash and chlorine may be reported in the waste analyses. Table 3-5 provides information on the typical characteristics of the wastes that are fed to Utility Boiler No. 6. The data provided on the wastes' physical parameters and the metals content is based upon waste analyses conducted between December 2002 and December 2005. Information provided on the organic components is based on process knowledge and is intended to provide a general idea of organics that may be present; it is not intended to be all encompassing.

**Table 3-5**  
**Summary of Typical Waste Characteristics for Utility Boiler No. 6 Wastes**

Parameter	Units	Range
Heating value <sup>1</sup>	Btu/lb	10,000 – 15,000
Total chlorine/chloride <sup>1</sup>	mg/kg	<10 – 150
Ash <sup>1</sup>	mg/kg	< 100 – 2,000
<i>Metals: <sup>1</sup></i>		
Antimony	mg/kg	< 1
Arsenic	mg/kg	< 0.1
Barium	mg/kg	< 1
Beryllium	mg/kg	< 0.1
Cadmium	mg/kg	< 0.1
Chromium	mg/kg	< 0.2 – 2.5
Lead	mg/kg	< 1
Mercury	mg/kg	< 0.1
Silver	mg/kg	< 1
Thallium	mg/kg	< 1
<i>Organics: <sup>2</sup></i>		
Butanol	wt %	30 – 45
Butanediol	wt %	0 – 5
γ-Butylacetone	wt %	30 – 40
Ethanol	wt %	0 – 25
Hydroxyl butyl alcohol	wt %	5 – 10
Methanol	wt %	5 – 100
Methyl acetate	wt %	0 – 80
Propanol	wt %	20 – 30
Tetrahydrofuran	wt %	0 – 45
Toluenediamine isomers	wt %	0 – 100

<sup>1</sup> Based on data collected between December 2002 and December 2005.

<sup>2</sup> Based on process knowledge.



## Section 4

# Engineering Description

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BASF operates three boilers which co-fire hazardous waste derived fuel and fuel gas for energy recovery. These three units are designated as the Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. The following sections provide a description of each boiler system. Engineering drawings for the boilers are provided in Appendix B.

### 4.1 Amines Boiler

BASF has been operating the Amines Boiler since 1988. The boiler has a design thermal capacity of 8.7 million British thermal units per hour (MMBtu/hr) and is capable of producing a maximum of 9,000 lb/hr of 650 pounds per square inch gauge (psig) steam at 650°F. The boiler was manufactured by McGill Environmental and is a three-zone, low-NO<sub>x</sub> design capable of burning natural gas, liquid fuels and off gases from unit production vents. The main components of the Amines Boiler are the oxidizing zone, a reducing zone, a reoxidation zone, a waste heat boiler with an economizer, an induced draft (ID) fan, a main stack, and an emergency stack. The combustor of the Amines Boiler is horizontal with refractory lining and has a cross-section of approximately 23.4 square feet at the widest section of the chamber. The stack of Amines Boiler is approximately 79 feet above grade. A schematic of the Amines Boiler is provided in Figure 4-1 at the end of this section.

Liquid wastes that are fed to the Amines Boiler are generated from the production of a variety of specialty amines and arrive at the steam plant directly from the on-site plant processes that generate them. The liquid fuels for the boiler are stored in Tank TK-1400. In addition to the production wastes, methanol is periodically burned in the Amines Boiler. The methanol is used to flush the lines and equipment and is only fed between the production of specialty amines.

In addition to natural gas, which is used as the primary fuel and is purchased from a supplier, supplemental gaseous fuels are also used. The supplemental gaseous fuels consist of process vent gases, which are generated in a variety of sources from the morpholine and amines production plants. The vent gases are generated from the vessel pressure control systems. The pressure control systems utilize nitrogen and normal process vapor pressure to provide the appropriate operating pressures within the reactor and distillation systems. Some vent gases are also generated from vacuum pumps and compressors that remove air from vacuum distillation systems and other pumps that provide purge air. High-pressure systems that

require purge of inert or contaminated gases from reactor and distillation vessels are another source of vent gases.

The first zone of the three-zone combustion system is an oxidizing chamber where the liquid waste fuels and off gases are first introduced. The normal operating temperature range of this zone is 2,200 °F to 2,600°F with a minimum oxygen content of 0.5 percent. The estimated residence time of this zone is approximately three seconds. The oxidizing chamber is followed by a reducing zone. In this zone, combustion gases and additional fuels are added to provide sub-stoichiometric oxygen environment to convert nitrogen oxides (NO<sub>x</sub>) to nitrogen. The temperature is not controlled in this zone, but typically runs 100°F to 200°F cooler than the oxidizing chamber. The residence time of this chamber is also estimated to be three seconds. The final zone is the reoxidation chamber. In this zone, the remaining residual combustibles from the reducing zone are completely consumed by adding combustion air. No auxiliary fuel is introduced in this zone. Steam or recycle flue gas is added for temperature control. The residence time of this section is also estimated to be three seconds.

The system is equipped with a horizontal fire tube boiler and a package economizer. After exiting the reoxidation zone, the gases pass through the boiler section and the economizer, reducing the gas temperature to 350°F to 500°F. The gases exit through either the emergency stack or main stack after exiting the economizer. When the boiler is shut down, process vents are still burned and the flue gas is directed through the emergency stack. Otherwise, the flue gases exit through the main stack.

## 4.2 Utility Boiler No. 3

Utility Boiler No. 3 was manufactured by Babcock & Wilcox and has been in operation since 1958. The boiler has a design thermal capacity of 285 MMBtu/hr and is capable of producing a maximum of 205,000 lb/hr of 650-psig steam at 750°F. The boiler was designed to burn natural gas, vent gases, and liquid fuels. The main components of Utility Boiler No. 3 are the firebox, a superheater, an economizer, a forced draft fan, and a stack. The stack is approximately 75 feet above grade. A schematic of Utility Boiler No. 3 is provided in Figure 4-2 at the end of this section.

Typically, Utility Boiler No. 3 utilizes natural gas for approximately 85 percent of the fuel requirements, with liquid hazardous waste comprising the other 15 percent. Natural gas is the primary fuel for this boiler. However, the boiler has the capability of burning hydrogen and fuel oil.

The liquid wastes that are fed to Utility Boiler No. 3 are generated from the production tetrahydrofuran and polytetrahydrofuran and arrive at the unit directly from the on-site plant

processes that generate them. The wastes consist of methanol, light ends, isopropanol, or mixed alcohols. The methanol and mixed alcohols are products of the production of 1,4-Butanediol. All waste streams are hard-piped from the production areas to storage tanks, D-465 and TK-795.

In addition to natural gas, the boiler also has the capability to burn supplemental gaseous fuel. The supplemental gaseous fuel consist of hydrogen and carbon monoxide. The supplemental gaseous fuel is integrated into the main fuel (natural gas) feed as an auxiliary fuel prior to combustion.

### 4.3 Utility Boiler No. 6

Utility Boiler No. 6 was manufactured by Babcock & Wilcox and has been operation since 1976. The boiler has a design thermal capacity of 250 MMBtu/hr and is capable of producing a maximum of 220,000 lb/hr of 650-psig steam at 750°F. The boiler is a "D"-shaped gas-fired package boiler with an economizer and NO<sub>x</sub> controls. It was designed to burn natural gas, vent gases, and waste liquid fuels. The main components of Utility Boiler No. 6 are a firebox, a superheater, an economizer, a forced draft fan, and a stack. Utility Boiler No. 6 is comparable to Utility Boiler No. 3 in function and wastes burned. However, Utility Boiler No. 6 has a lower residence time and a shorter stack. The stack is approximately 60 feet tall. A schematic of Utility Boiler No. 6 is provided in Figure 4-3 at the end of this section.

Typically, Utility Boiler No. 6 utilizes natural gas for approximately 85 percent of the fuel requirements, with liquid hazardous waste comprising the other 15 percent of fuel requirements. Natural gas is the primary fuel for this boiler.

The liquid wastes that are burned in Utility Boiler No. 6 are generated from the production tetrahydrofuran and polytetrahydrofuran and arrive at the unit directly from the on-site plant processes that generate them. The wastes consist of methanol, mixed alcohols, and waste diamine vicinals. The methanol and mixed alcohols are products of the production of 1,4-Butanediol and the diamine vicinals come from the production of toluene diamine. All waste streams are hard-piped from the production areas to a storage tank, TK-795, which feeds the boiler.

### 4.4 Hazardous Waste Residence Time

At the request of the LDEQ, BASF has calculated the hazardous waste residence time for each of the boilers. The sections that follow present the residence time for each boiler and describe the way in which it was calculated. Cross-sectional sketches that support these calculations are provided in Appendix B.

#### 4.4.1 Amines Boiler

As described previously, the Amines Boiler has three main zones to the combustion chamber: the oxidizing zone, the reducing zone, and the reoxidation zone. The residence time for this unit has been divided into each of these three zones. Table 4-1 illustrates the residence time calculations for the Amines Boiler.

**Table 4-1**  
**Amines Boiler Residence Time**

Combustion Zone	Volume (ft <sup>3</sup> )	Gas Flow Rate (acfm)	Residence Time (sec)
Oxidizing zone	138.1	16,910	0.49
Reducing zone	198.5	16,775	0.71
Reoxidation zone	232.2	21,433	0.65
Total	---	---	1.85

#### 4.4.2 Utility Boilers

The volume of the combustion chamber in Utility Boiler No. 3 is 7,148 cubic feet (ft<sup>3</sup>). The volume of the combustion chamber in Utility Boiler No. 6 is 2,509 ft<sup>3</sup>. Table 4-2 illustrates the residence time calculations for the Utility Boilers.

**Table 4-2**  
**Utility Boilers Residence Time**

Combustion Zone	Volume (ft <sup>3</sup> )	Gas Flow Rate (acfm)	Residence Time (sec)
Utility Boiler No. 3	7,148	355,840	1.21
Utility Boiler No. 6	2,509	389,220	0.39

Figure 4-1  
Amines Boiler Schematic

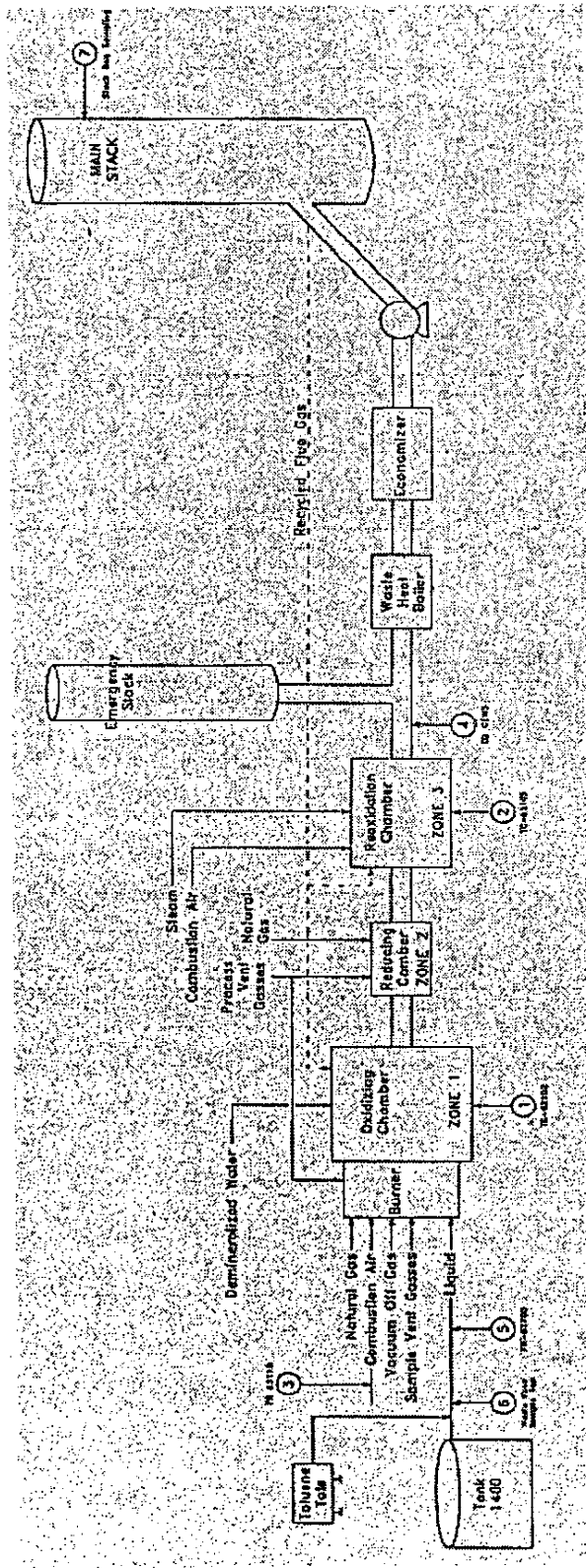


Figure 4-2  
Utility Boiler No. 3 Schematic

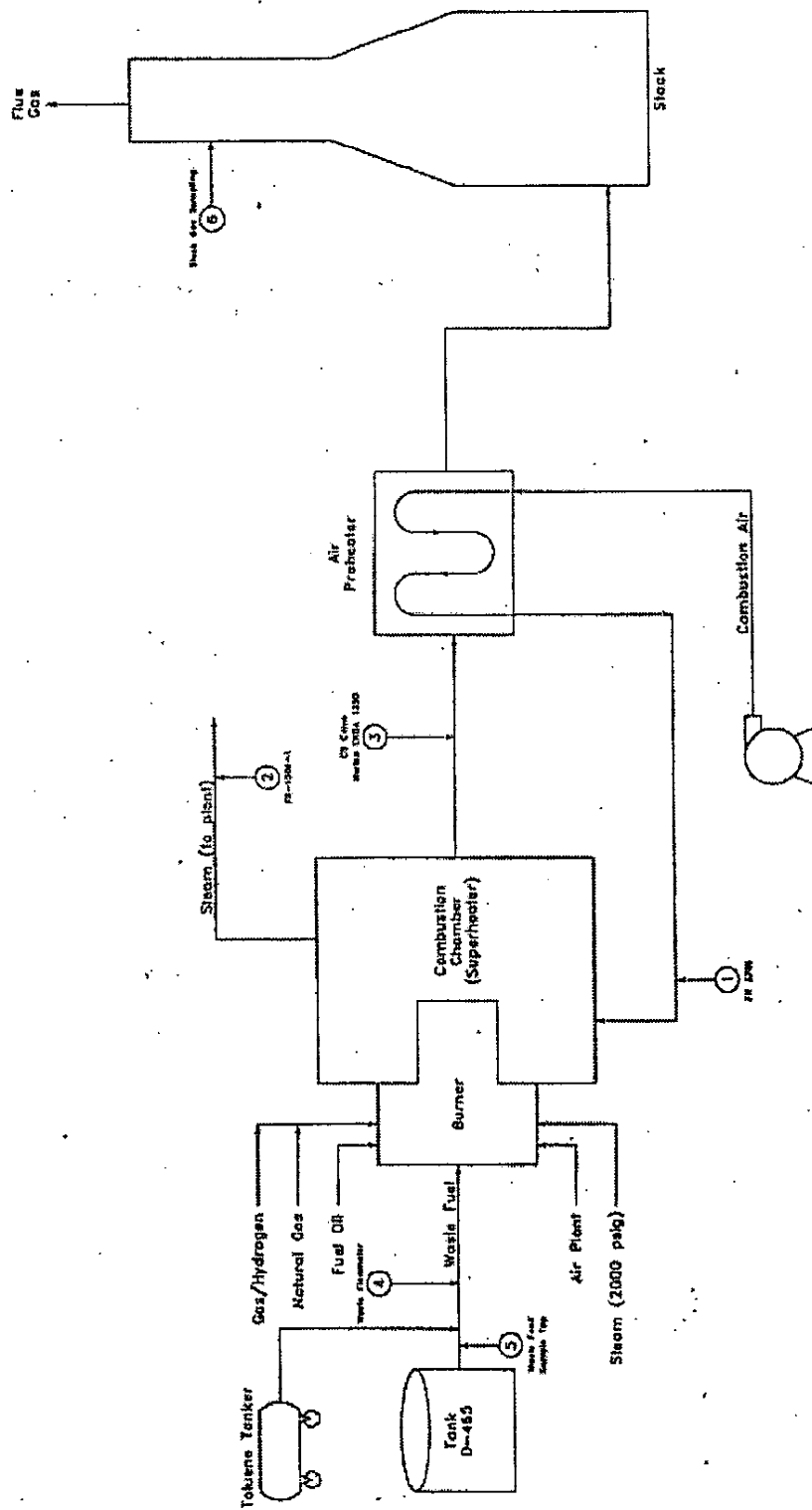
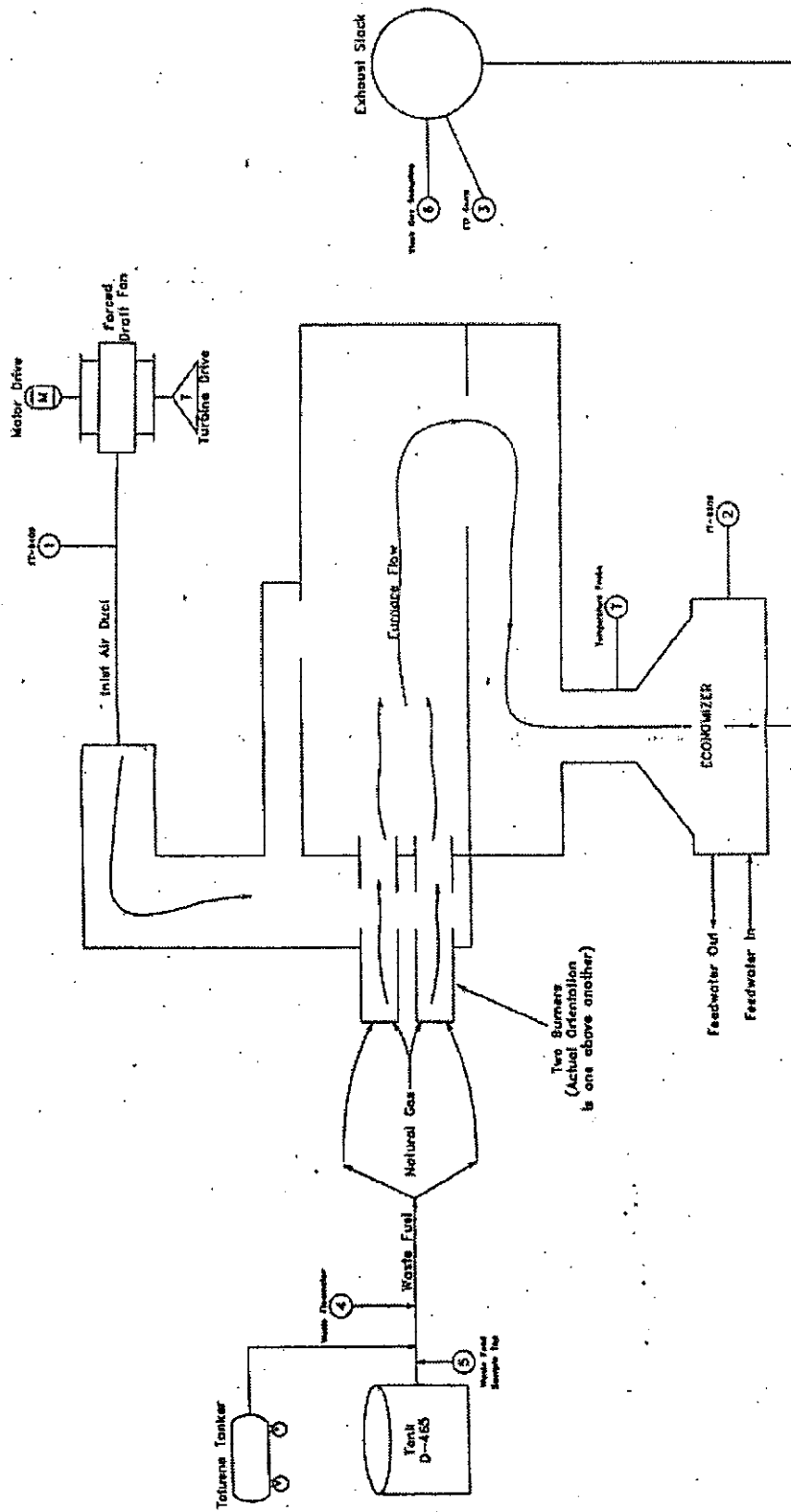


Figure 4-3  
Utility Boiler No. 6 Schematic



## 5.4 Automatic Waste Feed Cutoff System

40 CFR § 266.102(e)(7)(ii) requires that a facility operate the boilers with functioning systems that automatically cut off the hazardous waste feed when operating conditions deviate from those established in the permit. BASF will operate an AWFCO system for each boiler in accordance with the RCRA Part B permit. All of the process parameters listed in Table 5-1, in addition to the CO CEMS, will be included in the AWFCO system. Table 5-3 provides a list of the expected cutoff triggers for each parameter. All trigger limits will be established as HRAs. The actual trigger values for some of the AWFCOs will be determined by the results of the trial burn; limits for others are based on demonstrations made during the 1997 Trial Burn.

**Table 5-3  
Future Automatic Waste Feed Cutoffs**

Tag	Description	Trigger Limit	Averaging Period
<b>Amines Boiler</b>			
TC 82102	Minimum oxidizer chamber temperature	1,990°F	HRA
TC 82105	Minimum reoxidizer chamber temperature	1,596°F	HRA
FR 82700	Maximum liquid waste feed rate	1,206 lb/hr	HRA
FR 83116	Maximum stack gas flow rate	5,000 scfm <sup>1</sup>	HRA
AR 83112 AR 83114	Maximum stack gas CO concentration	100 ppmv	HRA
<b>Utility Boiler No. 3</b>			
TI 3732	Minimum combustion chamber temperature	1,100°F <sup>1</sup>	HRA
FI 3704	Minimum steam production rate	20,000 lb/hr	HRA
FIC 3334	Maximum liquid waste feed rate	25 gpm <sup>1</sup>	HRA
FIT 13001	Maximum stack gas flow rate	65,000 scfm <sup>1</sup>	HRA
AIC3910	Maximum stack gas CO concentration	100 ppmv	HRA
<b>Utility Boiler No. 6</b>			
TI 6201	Minimum combustion chamber temperature	950°F <sup>1</sup>	HRA
FT 6018	Maximum liquid waste feed rate	11 gpm	HRA
FI 6200	Minimum steam production rate	22,000 lb/hr	HRA
FIT 16001	Maximum stack gas flow rate	73,000 scfm <sup>1</sup>	HRA
AIC6310	Maximum stack gas CO concentration	100 ppmv	HRA

<sup>1</sup> This operating limit is a target value. Actual value will depend on the results of the trial burn.

During the Trial Burn, BASF will be operating the boilers at the edge of their normal operating window in order to achieve flexible permit limits in the future. In order to accomplish this goal, BASF will have to deactivate their current AWFCOs for all parameters except for carbon monoxide. In order to ensure continued protection of human health and the environment,

BASF will institute temporary AWFCO limits on each boiler. The levels proposed for each boiler are provided in Table 5-4.

**Table 5-4**  
**Proposed Temporary Automatic Waste Feed Cutoffs for the Trial Burn**

Tag	Description	Trigger Limit	Averaging Period
<i>Amines Boiler</i>			
TC 82102	Minimum oxidizer chamber temperature	1,900°F	HRA
TC 82105	Minimum reoxidizer chamber temperature	1,500°F	HRA
FR 82700	Maximum liquid waste feed rate	1,500 lb/hr	HRA
FR 83116	Maximum stack gas flow rate	7,000 scfm	HRA
AR 83112 AR 83114	Maximum stack gas CO concentration	100 ppmv	HRA
<i>Utility Boiler No. 3</i>			
TI 3732	Minimum combustion chamber temperature	900°F	HRA
FI 3704	Minimum steam production rate	15,000 lb/hr	HRA
FI 3704	Maximum steam production rate	210,000 lb/hr	HRA
FIC 3334	Maximum liquid waste feed rate	40 gpm	HRA
FIT 13001	Maximum stack gas flow rate	80,000 scfm	HRA
AIC3910	Maximum stack gas CO concentration	100 ppmv	HRA
<i>Utility Boiler No. 6</i>			
TI 6201	Minimum combustion chamber temperature	750°F	HRA
FT 6018	Maximum liquid waste feed rate	15 gpm	HRA
FI 6200	Minimum steam production rate	17,000 lb/hr	HRA
FI 6200	Maximum steam production rate	270,000 lb/hr	HRA
FIT 16001	Maximum stack gas flow rate	90,000 scfm	HRA
AIC6310	Maximum stack gas CO concentration	100 ppmv	HRA

## 5.5 Emergency Shutdown System

Emergency shutdown features are included to protect the equipment in the event of a malfunction. An emergency shutdown will stop the waste and the fuel feed when triggered by a monitor signal. These parameter limits have been set independently of regulatory test conditions. These limits are based on equipment design and operating specifications and are considered good operating practices.

The following conditions will trigger a complete shutdown of the Amines Boiler:

- High Zone 1 temperature (> 2,800°F);
- High Zone 3 temperature (> 2,200°F);

- Low atomizing air pressure (< 50 psig);
- High pilot fuel gas pressure (> 25 psig);
- High burner fuel gas pressure (> 50 psig);
- Low fuel gas pressure (< 15 psig);
- Low combustion air flow rate (< 400 scfm); and
- Loss of flame signal.

The following conditions will trigger a complete shutdown of the Utility Boiler No. 3:

- High natural gas pressure (> 12 psig);
- Low main natural gas pressure (< 25 psig);
- High burner natural gas pressure (>12 psig);
- Low combustion air flow rate (< 25 percent valve);
- Low steam drum level (< 7.13 percent);
- High furnace pressure (> 7 in. w.c.);
- Low instrument air pressure (< 35 psig); and
- Loss of flame signal.

The following conditions will trigger a complete shutdown of the Utility Boiler No. 6:

- Low natural gas pressure (< 1.5 psig);
- High natural gas pressure (> 8 psig);
- Low combustion air flow rate (< 24 percent valve);
- Low steam drum level (< 15 percent);
- High furnace pressure (> 12 in. w.c.);
- Low instrument air pressure (< 60 psig); and
- Loss of flame signal.



## Section 6

# Trial Burn Operations

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BASF intends to perform one test condition for the Amines Boiler and two test condition each for Utility Boiler No. 3 and Utility Boiler No. 6 to demonstrate conformance with the applicable RCRA performance standards and to establish permit limits. For each test condition, target operating conditions and spiking rates have been established and a sampling plan has been developed. Achievement of each of these goals will require close supervision by an individual trained in coordinating complicated trial burn efforts. RMT will provide a Project Coordinator for this test that is experienced with these duties. Details on this individual's responsibilities as well as anticipated personnel assignments are provided in the QAPP in Appendix A. Information on the boiler operations that will be demonstrated during the testing, the preparation of materials to be fed during the testing, the amount of waste to be used, and a schedule for the testing are presented here.

### 6.1 Amines Boiler

One trial burn condition will be performed for the Amines Boiler. Condition 1 will be performed to demonstrate compliance with the PM emission standard of 40 CFR § 266.105 and the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 1, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate limit for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 1 is provided in Table 6-1.

**Table 6-1  
Amines Boiler: Condition 1**

<b>Operating Parameter</b>	<b>Units</b>	<b>Target Value<sup>1</sup></b>
Oxidizer combustion chamber temperature	°F	2,300
Reoxidizer combustion chamber temperature	°F	1,900
Hazardous waste feed rate	lb/hr	1,000
Steam production rate	Mlb/hr	7.0
Stack gas flow rate	scfm	5,000
Ash feed rate	lb/hr	2.0
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	350
Stack gas flow rate	acfm	7,600
	dscfm	4,500
Stack gas oxygen concentration	% vol dry	> 2.5

<sup>1</sup> Target OPLs shown in bold text.

## 6.2 Utility Boiler No. 3

Two trial burn conditions will be performed for Utility Boiler No. 3. Condition 2A will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Condition 2B will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104.

### 6.2.1 Condition 2A

Condition 2A is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 2A, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 2A is provided in Table 6-2.

**Table 6-2**  
**Utility Boiler No. 3: Condition 2A**

<b>Operating Parameter</b>	<b>Units</b>	<b>Target Value<sup>1</sup></b>
Combustion chamber temperature	°F	2,000
Hazardous waste feed rate	gpm	25
Steam production rate	Mlb/hr	175
Stack gas flow rate	scfm	65,000
Ash feed rate	lb/hr	30
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	400
Stack gas flow rate	dscfm	54,000
Stack gas oxygen concentration	% vol dry	> 1.0

<sup>1</sup> Target OPLs shown in bold text.

### 6.2.2 Condition 2B

Condition 2B is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 2B, BASF will establish the minimum combustion chamber temperature limit for the boiler. The waste stream will be spiked with the chosen POHC. A summary of the operating conditions for Condition 2B is provided in Table 6-3.

**Table 6-3**  
**Utility Boiler No. 3: Condition 2B**

<b>Operating Parameter</b>	<b>Units</b>	<b>Target Value<sup>1</sup></b>
Combustion chamber temperature	°F	1,100
Hazardous waste feed rate	gpm	1
Steam production rate	Mlb/hr	20
Stack gas flow rate	scfm	7,050
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	270
Stack gas flow rate	dscfm	6,000
Stack gas oxygen concentration	% vol dry	> 1.0

<sup>1</sup> Target OPLs shown in bold text.

### 6.3 Utility Boiler No. 6

Two trial burn conditions will be performed for Utility Boiler No. 6. Condition 3A will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Condition 3B will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104.

#### 6.3.1 Condition 3A

Condition 3A is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 3A, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 3A is provided in Table 6-4.

Table 6-4  
Utility Boiler No. 6: Condition 3A

Operating Parameter	Units	Target Value <sup>1</sup>
Combustion chamber temperature	°F	2,000
Hazardous waste feed rate	gpm	8.4
Steam production rate	Mlb/hr	220
Stack gas flow rate	scfm	73,000
Ash feed rate	lb/hr	30
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	425
Stack gas flow rate	dscfm	62,000
Stack gas oxygen concentration	% vol dry	> 1.0

<sup>1</sup> Target OPLs shown in bold text.

#### 6.3.2 Condition 3B

Condition 3B is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 3B, BASF will establish the minimum combustion

chamber temperature limit for the boiler. The waste stream will be spiked with the chosen POHC. A summary of the operating conditions for Condition 3B is in Table 6-5.

**Table 6-5**  
**Utility Boiler No. 6: Condition 3B**

<b>Operating Parameter</b>	<b>Units</b>	<b>Target Value<sup>1</sup></b>
Combustion chamber temperature	°F	950
Hazardous waste feed rate	gpm	1
Steam production rate	Mlb/hr	22
Stack gas flow rate	scfm	7,200
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	350
Stack gas flow rate	dscfm	6,000
Stack gas oxygen concentration	% vol dry	> 1.0

<sup>1</sup> Target OPLs shown in bold text.

#### 6.4 Selection of Principal Organic Hazardous Constituents

As provided in 40 CFR § 270.66(e), POHCs must be designated for a trial burn, and a DRE for these compounds must be demonstrated for the boilers. The POHC must be chosen based on the degree of difficulty of incineration of the organic constituents in the waste. There are two primary ranking hierarchies used as criteria in the selection of POHCs to ensure that the POHCs chosen represent the widest range of compounds expected to be burned.

The first ranking is the USEPA's incinerability list, included in USEPA's *Guidance Manual for Hazardous Waste Incinerator Permits*, July 1983, (EPA/SW-966), which ranks compounds by heat of combustion. This list is divided into three groups, of which Group I contains compounds with heats of combustion that range from zero to 3.99 kilocalories per gram (kcal/g). As a group, these compounds are generally highly halogenated ethylenes, benzenes, and ethanes. Any compound in Group I is generally considered difficult to burn and is not normally used as a fuel. These compounds, therefore, make acceptable POHCs.

The heat of combustion approach to POHC selection is based on equilibrium theories which claim that the primary concern in evaluating the difficulty of destruction for a compound is the amount of energy necessary to complete the combustion process and form water, carbon dioxide, and, in some cases, an acid gas, as final combustion products. The second POHC selection approach is based on the Thermal Stability Index (TSI) developed by Dellinger *et. al.*, at the University of Dayton Research Laboratory. This approach has been included in the USEPA's handbook *Guidance on Setting Permit Conditions and Reporting Trial Burn Results*, January 1989, (EPA/625/6-89/019). This ranking of compounds is based on their thermal

stability, with the most stable being considered the most difficult to burn. The compounds are divided into seven classes. Compounds in Class 1 are considered the most difficult to burn. Therefore, these compounds make acceptable POHCs.

In addition to these two organic compound rankings, POHC selection was influenced by other criteria as follows:

- *Physical State:* POHCs have been limited to those constituents that are miscible liquids at ambient temperatures and pressures to facilitate POHC handling and quantification;
- *Stability:* Compounds selected as POHCs are sufficiently stable and have boiling points suitable for conventional stack sampling techniques;
- *Representative:* The compounds selected as POHCs are representative of the types of constituents that the systems will typically handle; and
- *Availability and cost:* The compounds selected as POHCs are sufficiently available so that they can be purchased or formulated at a reasonable cost and are all in common use.

BASF is proposing to use toluene as the POHC for the trial burn. Toluene is in Class 2 of the TSI. The wastes burned in the boilers do not contain any of the compounds included in Class 1 of the TSI. Therefore, demonstrating DRE with a Class 2 compound should provide the required operating flexibility for the boilers.

Toluene has a heating value of 10.14 kilocalories per gram (kcal/g) and is ranked 35<sup>th</sup> on the TSI, making it a Class 2 compound. Toluene is suitable for current stack sampling methods. The VOST (SW-846 Method 0030) method is typically used to sample stack gas for toluene. Additional properties of the selected POHC are provided in Table 6-6.

**Table 6-6**  
**Properties of Selected POHC**

Property	Toluene
Synonyms	Methylbenzene
Formula	C <sub>7</sub> H <sub>8</sub>
Chemical Abstract Service	108-88-3
Molecular weight, lb/lbmol	92.13
Boiling point, °C	110.6
Heat of combustion, kcal/g	10.14
Incinerability ranking <sup>1</sup>	284
Thermal stability ranking <sup>2</sup>	Class 2, 35

<sup>1</sup> Guidance Manual for Hazardous Waste Incinerator Permits, USEPA, EPA/SW-966, July 1983.

<sup>2</sup> Guidance on Setting Permit Conditions and Reporting Trial Burn Results - Volume II of the Hazardous Waste Incineration Guidance Series, USEPA, EPA/625/6-89/019, January 1989.

## 6.5 POHC Feed Rates

The amount of POHC detected in the stack gases will be used to determine the DRE for the boilers. DRE is defined in 40 CFR § 266.104(a). DRE is determined for the POHC from the following equation:

$$DRE = \left[ 1 - \frac{W_{out}}{W_{in}} \right] \times 100$$

where:

- $W_{out}$  = Mass emission rate of the POHC present in exhaust emissions prior to release to the atmosphere; and
- $W_{in}$  = Mass feed rate of the same POHC in the waste feed.

The POHC must be supplied to the boilers in sufficient quantity to be detectable in the stack gas. Each stack sampling method has a minimum detection limit. Using the most conservative approach for the test, any compound which is found to be present in the stack gas at quantities below the method minimum detection limit or that is undetected in the stack gases is assumed to be present at the minimum detection limit. Therefore, it is very important to ensure that there is adequate quantity of POHC in the boiler feed to demonstrate the target 99.99 percent DRE.

The required POHC feed rate for each test condition is determined by back-calculating from the stack sampling method detection limits and the target DRE (99.99 percent) using the following equation, which is derived from the DRE equation in 40 CFR § 266.104(a):

$$W_{in} = W_{out} \times \left[ \frac{100}{100 - DRE} \right]$$

Table 6-7 provides the POHC quantity that will be required for the trial burn conditions.

**Table 6-7**  
**POHC (Toluene) Quantity**

	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Sampling method	VOST	VOST	VOST	VOST	VOST
Method detection limit	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)
Estimated stack flow rate	4,500 dscfm	54,000 dscfm	6,000 dscfm	62,000 dscfm	6,000 dscfm
Target DRE	99.99%	99.99%	99.99%	99.99%	99.99%
Emission rate required for detection	0.000042 lb/hr	0.00051 lb/hr	0.000056 lb/hr	0.00058 lb/hr	0.000056 lb/hr
Required POHC feed rate	0.42 lb/hr	5.1 lb/hr	0.56 lb/hr	5.8 lb/hr	0.56 lb/hr

## 6.6 Spiking of POHC

Spiking will be required to provide adequate quantities of toluene to demonstrate DRE. BASF will operate a toluene spiking system during the trial burn. The system will consist of a drum, a pump, a flow control valve, and a mass flow meter. The toluene will be pumped directly into a liquid waste feed lines, downstream of the flow monitors. The spiking location is depicted on the figures in Appendix B. The flow rates of the waste feed in the feed lines should be sufficient to provide mixing of toluene and liquid waste. Table 6-8 provides the toluene spiking rates for each of the trial burn conditions. These values were chosen to provide an adequate safety factor above the calculated minimum required POHC feed rates given in Table 6-7.

**Table 6-8**  
**POHC (Toluene) Spiking Rates**

Trial Burn Condition	Units	Toluene Spiking Rate
Condition 1	lb/hr	10
Condition 2A	lb/hr	60
Condition 2B	lb/hr	10
Condition 3A	lb/hr	60
Condition 3B	lb/hr	10

## 6.7 Spiking of Ash

BASF will demonstrate the maximum ash feed rate to each boiler during the trial burn. BASF plans to spike the liquid waste with a titanium dioxide dispersion. The system will consist of a drum, a pump, a flow control valve, and a mass flow meter. The ash material will be pumped directly into the waste feed line, adjacent to the POHC injection systems. The spiking location is depicted on the figures in Appendix B. The flow rates of the waste feed in the feed lines should be sufficient to provide mixing of the ash material and waste. The waste will be spiked with a titanium dioxide dispersion, consisting of titanium dioxide in ethylene glycol. The equivalent ash concentration of the dispersion is 20 percent by weight.

To determine the ash spiking rate for each condition, BASF back-calculated from acceptable PM emission levels. The following equation was used to determine the allowable PM mass emission rate for each condition:

$$PM_{Mass} = 0.08 \text{ gr / dscf} \times SF \times \frac{21 - O_2}{14} \times \frac{1 \text{ lb}}{7,000 \text{ gr}} \times \frac{60 \text{ min}}{1 \text{ hr}}$$

where:

$PM_{Mass}$  = Allowable mass emission rate of PM (lb/hr);

$SF$  = Stack flow rate (dscfm); and

$O_2$  = Oxygen content of stack gas (% vol dry).

Table 6-9 presents the calculations for each boiler.

**Table 6-9  
Ash Spiking Rate Calculations**

Variable	Units	Amines Boiler	Utility Boiler No. 3	Utility Boiler No. 6
Stack flow rate	dscfm	4,500	54,000	62,000
Oxygen content	% vol dry	3.0	3.0	3.0
Allowable particulate matter emission rate	lb/hr	4.0	47.6	54.7

The ash spiking rate was selected to allow for additional PM contribution from the waste feeds. Table 6-10 provides the titanium dioxide dispersion spiking rates for each of the trial burn conditions. These spiking rates may be adjusted prior to the testing to account for any ash present in the trial burn waste feeds.

**Table 6-10  
Ash Spiking Rates**

Trial Burn Condition	Units	Titanium Dioxide Dispersion Spiking Rate	Equivalent Ash Spiking Rate
Condition 1	lb/hr	10	2.0
Condition 2A	lb/hr	125	25
Condition 2B	lb/hr	0	0
Condition 3A	lb/hr	125	25
Condition 3B	lb/hr	0	0

## 6.8 Spiking Systems Components and Configuration

B3 Systems will operate the spiking systems during the stack testing. The spiking systems will consist of the following major equipment:

- Metering pumps;
- Mass flow meters; and
- Process control and data acquisition computer.

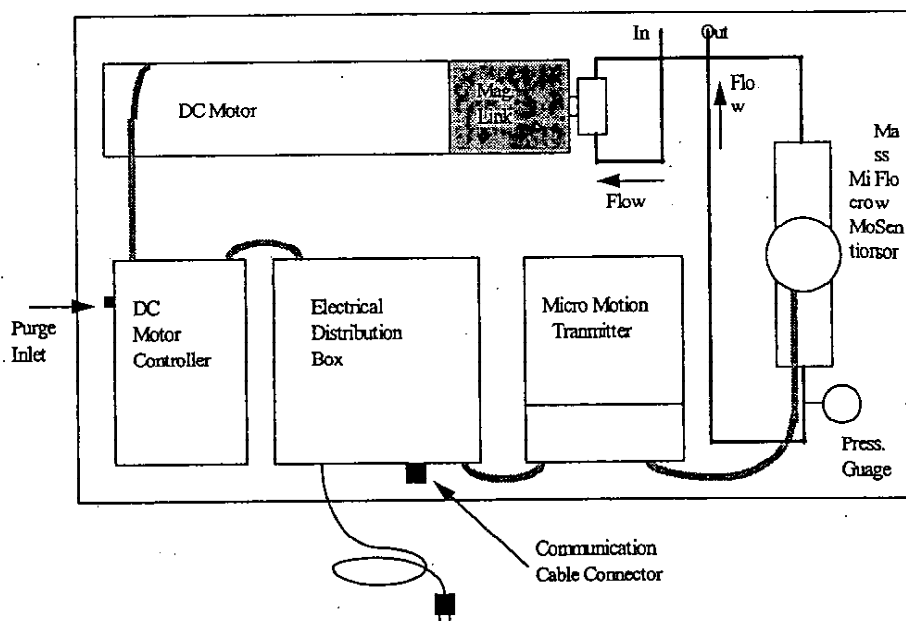
The spiking material is connected to the suction of the pump from the supply drum with flexible tubing. The pump transfers the fluid through the mass flow meter and into the waste feed line. The mass flow meter sends a signal to the process controller that will adjust the pump speed according to the set point. The data acquisition software will record the data

continuously, providing a complete record of spiking rates. A schematic of a spiking system is provided in Figure 6-1.

During testing, spiking rates can be displayed in real-time trends. This allows the operator to monitor the system for problems on a real-time basis. In addition, the system provides continuous monitoring for fluid temperature, system pressure, fluid density, and motor output. All of this information provides QA/QC that the material is homogeneous and that the system is operating properly.

The system also allows for high and low alarms to be set around the set point. When these alarm values are exceeded, the operator is notified by an audible alarm. With the computer monitoring the flows, alarm levels and adjusting flow rates to the set point every second, human error is minimized, and more accurate data is obtained.

**Figure 6-1**  
**Spiking System Schematic**



## 6.9 Test Materials and Quantities

Table 6-11 summarizes the quantity of materials required to conduct the testing. Triplicate runs will be carried out for each test condition. Each test run will require approximately four hours. Each condition will be performed over two days. An additional two hours of run time will be required for each day of testing in order to establish the steady state conditions before the start of the test runs, and one hour will be required between consecutive test runs. Therefore, for the

purpose of calculating test quantities, a total of 17 hours has been used for each condition. We have also added approximately 20 percent to each total to allow for unforeseen delays.

**Table 6-11**  
**Test Material Quantities**

	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Liquid waste	20,400 lb	34,800 gal	1,200 gal	10,300 gal	1,200 gal
Toluene	204 lb	1,224 lb	204 lb	1,224 lb	204 lb
Titanium dioxide dispersion	204 lb	2,550 lb	---	2,550 lb	---

## 6.10 Test Schedule

The sampling effort will require 11 days. During this period, sampling equipment and instruments will be prepared and calibrated, supplies will be brought on-site, and sampling locations will be prepared. The stack sampling contractor will move on site on the first day to set up for testing. Actual stack sampling for the conditions is expected to take 10 days.

The test conditions will each require three replicate test runs. Although the on-site activities will dictate the actual timing, a preliminary schedule is presented in Table 6-12. BASF may choose to run the test conditions in different order than presented in Table 6-12.

BASF has allowed one hour of run time in order to establish the steady state conditions before the start of the test runs. Steady state is defined as a condition when the combustion chamber temperatures and CO emissions remain stable with minimal fluctuation. BASF will use their extensive operating knowledge of the boilers to conservatively determine whether CO emissions and temperature values are experiencing more than minimal fluctuations. Operating experience has shown that after the adjustment of feed rates or operating conditions, steady-state condition can be achieved in less than one hour. For the purposes of the testing, we have increased the time to ensure the maximum stability of the system. The one-hour time period will begin when the liquid waste feed rate to the boilers has been established at the full test rate. If there is significant fluctuation at the end of the hour, the test will not begin until steady state conditions are achieved.

If an unplanned interruption occurs during a test run, BASF will allow time for the system to achieve steady-state prior to restarting the test run. If the interruption is less than one hour in duration, BASF will allow 15 minutes for the systems to re-establish steady-state. This 15-minute period will occur after the target operating conditions have been reestablished for the

boiler. If the interruption is greater than one hour, BASF may allow additional time to establish steady-state. This time period will be dictated by the nature of the interruption and will be discussed with LDEQ and USEPA representatives onsite.

**Table 6-12  
Test Schedule**

Day	Start	Stop	Activity
1	---	---	Set-up of sampling equipment for Amines Boiler and pre-test meetings
2	06:00	08:00	Begin feeding designated materials to Amines Boiler at Condition 1 rates and establish steady state operating conditions
2	08:00	12:00	Condition 1, Run 1
2	12:00	13:00	Set-up of sampling equipment for Run 2
2	13:00	17:00	Condition 1, Run 2
3	06:00	08:00	Begin feeding designated materials to Amines Boiler at Condition 1 rates and establish steady state operating conditions
3	08:00	12:00	Condition 1, Run 3
3	12:00	---	Set-up of sampling equipment for Utility Boiler No. 3
4	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2A rates and establish steady state operating conditions
4	08:00	12:00	Condition 2A, Run 1
4	12:00	13:00	Set-up of sampling equipment for Run 2
4	13:00	17:00	Condition 2A, Run 2
5	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2A rates and establish steady state operating conditions
5	08:00	12:00	Condition 2A, Run 3
6	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2B rates and establish steady state operating conditions
6	08:00	12:00	Condition 2B, Run 1
6	12:00	13:00	Set-up of sampling equipment for Run 2
6	13:00	17:00	Condition 2B, Run 2
7	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2B rates and establish steady state operating conditions
7	08:00	12:00	Condition 2B, Run 3
7	12:00	---	Set-up of sampling equipment for Utility Boiler No. 6
8	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3A rates and establish steady state operating conditions
8	08:00	12:00	Condition 3A, Run 1
8	12:00	13:00	Set-up of sampling equipment for Run 2
8	13:00	17:00	Condition 3A, Run 2

**Table 6-12 (continued)**  
**Test Schedule**

Day	Start	Stop	Activity
9	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3A rates and establish steady state operating conditions
9	08:00	12:00	Condition 3A, Run 3
10	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3B rates and establish steady state operating conditions
10	08:00	12:00	Condition 3B, Run 1
10	12:00	13:00	Set-up of sampling equipment for Run 2
10	13:00	17:00	Condition 3B, Run 2
11	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3B rates and establish steady state operating conditions
11	08:00	12:00	Condition 3B, Run 3
11	12:00	---	Break down sampling equipment



## Section 7

# Sampling and Analysis

Sampling and analysis performed during the test conditions described in Section 6 will demonstrate the performance of the boilers with respect to the applicable performance standards of RCRA. Each test condition will consist of three replicate test runs. For each run of each test condition, samples will be collected as noted in Sections 7.1 through 7.4, using procedures described in the QAPP found in Appendix A. The samples collected will be analyzed for the parameters discussed below. Table 7-1 provides an overview of the emissions demonstrations for each test condition.

**Table 7-1**  
**Emissions Demonstrations Overview**

Emission Demonstration	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Particulate matter	✓	✓		✓	
POHC (toluene)	✓	✓	✓	✓	✓
Carbon monoxide	✓	✓	✓	✓	✓
Hydrocarbons	✓	✓	✓	✓	✓

Liquid waste and stack gas samples will be collected during each test condition. This section of the Plan describes the sampling methods that will be employed. Since most of the proposed methods are standard reference methods, only brief descriptions are presented. Sample holding times will be consistent with the analytical requirements for the methods used. More detailed descriptions can be found in the indicated reference documents and in the QAPP.

### 7.1 Liquid Waste Sampling and Analysis

BASF personnel will collect the liquid waste samples from taps located in each feed line. The liquid waste sampling locations will be clearly labeled during the trial burn. The sample tap will be flushed initially (allowed to flow briefly) before the samples are collected.

At 30-minute intervals throughout each test run, approximately 250 milliliters (mL) of the liquid waste stream will be collected. The sampling location is depicted on the figures in Appendix B. The samples collected will be composited for each run into one-gallon jars. At the conclusion of each run, the sample will be mixed and four 500-mL aliquots will be poured into amber jars.

The samples will be isolated from sources of contamination during the sampling and compositing efforts. Two of the four samples will be used for analysis, and the remaining two samples will be archived.

Two 40-mL volatile organics analysis (VOA) sample vials will also be collected at 30-minute intervals during each test run. These samples will be composited in the laboratory prior to analysis. The cold samples will be emptied into a single narrow-mouth glass container for the composite and a single VOA will be filled from the composite. As is standard laboratory procedure, the time associated with making the composite will be minimized, thereby minimizing the potential for volatile loss.

The liquid waste samples will be analyzed to characterize the waste stream and collect information required to develop the operating limits. Higher heating value and specific gravity will be determined to characterize the waste stream. In addition, the liquid waste will be analyzed for the POHC (toluene) and for ash content. Table 7-2 summarizes the liquid waste samples to be taken, the parameters to be measured, and the frequency of measurement.

**Table 7-2**  
**Liquid Waste Sampling and Analytical Methods**

Sampling Method	Sampling Frequency/ Duration	Analytical Parameter	Analytical Method <sup>1</sup>
Tap sampling Glass bottles	Every 30 minutes	Higher heating value	ASTM Method D240
		Specific gravity	ASTM Method D1298
		Ash content	ASTM Method D482
Tap sampling VOA vials	Every 30 minutes	POHC (toluene)	SW-846 Method 8260B

<sup>1</sup> ASTM refers to American Society for Testing and Materials.

SW-846 refers to *Test Methods for Evaluating Solid Waste, Third Edition*, November 1986, and Updates.

## 7.2 Spiking Material Sampling and Analysis

The toluene and titanium dioxide dispersion spiking material will not be analyzed during the test. These will be pure materials purchased for testing. Laboratory analysis by the suppliers will be used to determine the spiking liquids' composition. Samples of the materials fed during the test will be collected and archived in case that subsequent analysis is required to confirm the materials' composition. A 250-mL aliquot of each spiking material will be collected at the beginning and end of each test run. These aliquots will be used to create one composite sample of each spiking material for the test program. The collected samples will be archived on-site.

### 7.3 Process Vent Sampling and Analysis

No process vents will be sampled during the trial burn. Process knowledge will be used to characterize the vent streams.

### 7.4 Stack Gas Sampling and Analysis

During the trial burn, the stack gas will be sampled for PM and toluene (POHC) emissions. CEMS will be used to monitor CO and oxygen in the stack gas. BASF also intend to monitor hydrocarbons (HC) during the trial burn. This demonstration is not required for the RCRA trial burn. However, BASF intends to collect this data for possible use as data in lieu of testing for future National Emission Standards for Hazardous Air Pollutants for Hazardous Waste Combustors (HWC NESHAP) compliance demonstrations.

The following sampling methods will be used during the trial burn:

- A combined USEPA Method 5 sampling train for measurement of PM emissions;
- An SW-846 (*Test Methods for Evaluating Solid Waste, Third Edition*, November 1986, and Updates) Method 0030 (Volatile Organic Sampling Train (VOST)) sampling train for measurement of toluene emissions (POHCs);
- USEPA Methods 3A, 25A, and 10 to monitor the concentrations of CO, HC, and oxygen in the stack gas.

Table 7-3 summarizes the stack gas samples to be taken, the parameters to be measured, and the frequency of measurement.

**Table 7-3**  
**Stack Gas Sampling and Analytical Methods**

Sampling Method	Sampling Frequency/Duration	Analytical Parameter	Analytical Method <sup>1</sup>
USEPA Method 5 <sup>2</sup>	2 hours	Particulate matter	USEPA Method 5
SW-846 Method 0030 <sup>3</sup>	4 tube sets, 40 minutes per tube set	Toluene	SW-846 Method 8260B
USEPA Methods 3A, 25A, and 10 <sup>3</sup>	Continuous	Carbon monoxide, hydrocarbons, and oxygen	USEPA Methods 3A, 25A, and 10

<sup>1</sup> SW-846 refers to *Test Methods for Evaluating Solid Waste, Third Edition*, November 1986, and Updates. USEPA Method refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR Part 60.

<sup>2</sup> This method will be performed for Conditions 1, 2A, and 3A.

<sup>3</sup> This method will be performed for Conditions 1, 2A, 2B, 3A, and 3B.



## Section 8

# Trial Burn Report

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The Trial Burn Report will be submitted to LDEQ and USEPA within 90 days of completing the testing. The Trial Burn Report will be based on the report format specified in the LDEQ's *Trial Burn Report Outline* (LDEQ, December 2003). The latest version of this report outline will be obtained from LDEQ's website (<http://www.deq.louisiana.gov/portal/tabid/135/Default.aspx#reports>) prior to report preparation. In accordance with this, the report will use the following basic outline:

- 1.0 Summary of Test Results
- 2.0 Introduction/Process Description
- 3.0 Operating Data Summary Target Operating Conditions
- 4.0 Feedstream Sampling and Analysis
- 5.0 RCRA Emissions and Performance Results
- 6.0 Quality Assurance/Quality Control Documentation
- 7.0 Proposed Permit Limits
- 8.0 Methods for Continuing Compliance

Appendix A – Stack Sampling Report

Appendix B – Feedstream Sampling Report

Appendix C – Spiking Report

Appendix D – QA/QC Data Report

Appendix E – Calibration Data

Appendix F – Sample Emissions Calculations

Appendix G – Operating Data Report

Appendix H – Field Logs

Appendix I – Analytical Data Packages

Appendix J – Resumes

As the list above indicates, the section entitled "Section 6.0. APCE Residue Sampling and Analysis" in LDEQ's trial burn report outline will not be included in the final test report because there is no residue sampling and analysis included in this test program. Subsequent sections in the trial burn report outline will be renumbered as appropriate.



# **Appendix A**

## **Quality Assurance Project Plan**

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527 Plymouth Road, Suite 406  
Plymouth Meeting, PA 19462  
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# **Quality Assurance Project Plan for Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6**

**BASF Corporation**

*Geismar, Louisiana*

**September 2006**

**Revision 1: December 2006**



RMT, Inc. | BASF Corporation

00-69513.09

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## Signature Page

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Facility: BASF Corporation (BASF), Geismar, Louisiana  
Unit ID: Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6  
Test Title: Trial Burn

This Quality Assurance Project Plan (QAPP) has been developed for the trial burn to be conducted for BASF's Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. This version of the QAPP (Revision 1, December 2006) has been distributed to and read by the signatories. By signing, the signatories agree to the appropriate information pertaining to their project responsibilities provided in the QAPP.

---

Dana M. Scott  
BASF Corporation  
Test Burn Manager

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Date

---

Dr. Robert Adams  
METCO Environmental  
Quality Assurance Officer

---

Date

---

S. Heather McHale, P.E.  
RMT, Inc.  
Project Coordinator

---

Date

---

Blair Shields  
METCO Environmental  
Project Director

---

Date

---

Jervy Chevallier  
METCO Environmental  
Field Testing Supervisor

---

Date

---

Dan Ealy  
B3 Systems  
Spiking Task Leader

---

Date



## Signature Page

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Facility: BASF Corporation (BASF), Geismar, Louisiana  
Unit ID: Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6  
Test Title: Trial Burn

This Quality Assurance Project Plan (QAPP) has been developed for the trial burn to be conducted for BASF's Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. This QAPP has been distributed to and read by the signatories. By signing, the signatories agree to the appropriate information pertaining to their project responsibilities provided in the QAPP. Laboratory representatives have reviewed the methods and Louisiana Environmental Laboratory Accreditation Program (LELAP) approved laboratory standard operating procedures (SOPs) specified in the QAPP and certify that all methods will be performed in accordance with these requirements and any deviations will be noted.

---

Kevin Woodcock  
Project Manager  
Severn Trent Laboratories  
5815 Middlebrook Pike  
Knoxville, TN 37921

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Date



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Attachment 1	Laboratory Contact Information
Attachment 2	Contractor Contact Information
Attachment 3	Project Team Resumes
Attachment 4	Example Waste Feed Sampling Form
Attachment 5	B3 Standard Operating Procedure for Calibration Checks

- Perform spiking of ash; and
- Provide a spiking data report.

The subcontracted laboratory will:

- Perform sample analyses;
- Perform method and QAPP specified QA/QC;
- Provide a detailed Case Narrative; and
- Generate an analytical data report in a CLP-like format, as appropriate.

The Quality Assurance Officer will:

- Oversee sampling and analysis procedures;
- Provide input and document the observation of testing and corrective actions; and
- Review all analytical results.

## **2.1 BASF Test Burn Manager**

Dana M. Scott will serve as the BASF Test Burn Manager. Ms. Scott will be responsible for directing BASF personnel in the operations of the boilers during the testing. She will also ensure that all necessary boiler operating data is collected during the test.

## **2.2 RMT Project Coordinator**

Heather McHale of RMT will provide coordination and oversight during the test program. She will ensure that all test team members communicate throughout the test program and that the objectives of the Trial Burn Plan are met (*i.e.*, test operating conditions, spiking rates, field sampling objectives).

## **2.3 METCO Project Director**

Blair Shields of METCO will serve as the Project Director for the trial burn. He will be responsible for technical supervision of the project, data interpretation, and overall report preparation. He will coordinate with all laboratories and outside service providers. He will be the main contact for all laboratories and the trial burn project team.

## **2.4 METCO Field Testing Supervisor**

Jervey Cheveallier will serve as the Field Testing Supervisor. He will oversee the METCO field crew during the testing. He will be responsible for all aspects of sample collection and will report any deviations immediately to the Test Burn Manager and Project Coordinator.

Mr. Cheveallier is also a Certified Shipper and will be responsible for shipment of all samples to the laboratories. The samples will be packaged according to Department of Transportation (DOT) and International Air Transport Association (IATA) regulations. The majority of the samples will be transported to the laboratories by Federal Express.

## **2.5 Field Team**

The Field Team will be made up of BASF and METCO personnel. BASF operators will be responsible for collecting all process samples. METCO will take custody of the samples from the operators at the conclusion of the testing. All stack gas samples will be collected by METCO personnel, under the supervision of the Field Testing Supervisor.

## **2.6 B3 Systems Task Leader**

Dan Ealy will serve as the off-site Program Manager for B3 Systems. B3 Systems was founded in 1991 and has extensive experience in the spiking of inorganic and organic compounds. Mr. Ealy will ensure that the spiking crew is staffed with experienced technicians.

## **2.7 Quality Assurance Officer**

The Quality Assurance Officer will have overall QA authority for all aspects of the trial burn. The Quality Assurance Officer is organizationally independent of the trial burn technical staff and is not directly responsible for making any measurements during the test. Dr. Robert Adams of METCO has been selected as the Quality Assurance Officer. In this role, Dr. Adams will ensure that all field and lab procedures are performed in compliance with QAPP objectives and will perform the entire scope of duties outlined for Quality Assurance Officers by LDEQ on their website at <http://www.deq.louisiana.gov/portal/default.aspx?tabid=2378#qao>.

Some of the specific duties that the Quality Assurance Officer will perform include:

- Providing additional oversight for sampling activities during the testing;
- Providing oversight for sample handling, shipment and laboratory receipt, after the samples have been taken;
- Auditing on-site sampling procedures, sampling equipment, and QA/QC activities;
- Coordinating with the Test Burn Manager, the Project Coordinator, and agency personnel on-site to resolve any conflicts during the testing;
- Resolving any potential conflicts with laboratories conducting the analyses and communicating all changes to the Field Testing Supervisor prior to the actual stack testing;
- Providing laboratory communications oversight prior to, during, and after the sampling activities take place;

- Providing documentation of all laboratory communications for the duration of the project to ensure that potential QA/QC issues encountered during sample collection, analysis and data validation are accounted for in the assessment of data usability;
- Providing final data validation through a review of all laboratory reports for data quality issues, including review of case narratives for acceptability; and
- Providing a QA summary report that includes a listing of all deviations from the Trial Burn Plan or QAPP with corrective actions and the affect on data quality.

### 3.4 Stack Gas Sampling

The stack gas sampling will follow the methods documented in 40 CFR Part 60, Appendix A (USEPA Methods) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, April 1998 and updates) (SW-846). Any modifications to prescribed USEPA or SW-846 test methods will be outlined in the sampling procedure descriptions below. Pretest and post-test leak checks will be performed for each sampling train, as required by the respective test methods. Leak checks will also be performed at port changes. All sampling trains will be assembled and recovered in a mobile laboratory to ensure a clean environment. Table 3-1 summarizes the sampling procedures to be used during the trial burn for collection of stack gas samples.

**Table 3-1**  
**Stack Gas Sampling Summary**

Condition	Parameter	Sampling Method	Sample Fraction
1, 2A, 2B, 3A, 3B	Gas flow rate, composition, and moisture content	USEPA Methods 1-4	Not applicable
1, 2A, 3A	Particulate matter	USEPA Method 5	Filter
			Front-half acetone rinse
1, 2A, 2B, 3A, 3B	Toluene	SW-846 Method 0030	Tenax™ resin
			Tenax™ resin/charcoal
			Condensate

#### 3.4.1 Sampling Point Determination – USEPA Method 1

The number and location of the gas sampling points will be determined according to the procedures outlined in USEPA Method 1. Verification of absence of cyclonic flow will be conducted on each stack prior to each test condition by following the procedure described in USEPA Method 1.

A stack diagram for the Amines Boiler is provided as Figure 3-1. The sampling ports are located in the exhaust stack 13 feet, 8 inches (1.16 duct diameters) downstream from a constriction in the stack and 45 feet (3.83 duct diameters) upstream of the stack outlet. The stack diameter at this location is approximately 11 feet, 9 inches. For the USEPA Method 5 sampling train, eight points will be sampled from each of two ports for a total of 16 sampling points.

A stack diagram for Utility Boiler No. 3 is provided as Figure 3-2. The sampling ports are located in the rectangular exhaust stack 12 feet, 10 inches (2.42 equivalent duct diameters) downstream from a constriction in the stack and are 3 feet, 6 inches (0.66

equivalent duct diameters) upstream from the outlet of the stack. The equivalent stack diameter at this location is approximately 5 feet, 4 inches. For the USEPA Method 5 sampling train, five points will be sampled from each of five ports for a total of 25 sampling points.

A stack diagram for the Utility Boiler No. 6 is provided as Figure 3-3. The sampling ports are located in the exhaust stack 26 feet, 3 inches (3.28 duct diameters) downstream from the fan inlet and 21 feet, 1-inch (2.64 duct diameters) from the stack outlet. The stack diameter at this sampling location is approximately 8 feet. For the USEPA Method 5 sampling train, 12 points will be sampled from each of two ports for a total of 24 sampling points.

### **3.4.2 Flue Gas Velocity and Volumetric Flow Rate – USEPA Method 2**

The flue gas velocity and volumetric flow rate will be determined according to the procedures outlined in USEPA Method 2. Velocity measurements will be made using Type S pitot tubes conforming to the geometric specifications outlined in USEPA Method 2. Differential pressures will be measured with fluid manometers. Effluent gas temperatures will be measured with thermocouples equipped with digital readouts.

### **3.4.3 Flue Gas Composition and Molecular Weight – USEPA Method 3**

The composition of the bulk gas and the gas molecular weight at the stack (concentration of carbon dioxide and oxygen) will be determined by USEPA Method 3. An integrated sample of gas will be extracted throughout each run and collected in a Tedlar bag for each run. The sample will be analyzed for carbon dioxide and oxygen using an Orsat analyzer. The calculated molecular weight will be used for all isokinetic calculations.

### **3.4.4 Flue Gas Moisture Content – USEPA Method 4**

The flue gas moisture content will be determined in conjunction with each USEPA Method 5 sampling train according to the sampling and analytical procedures outlined in USEPA Method 4. The impingers will be connected in series and will contain reagents as described for each sampling method. The impingers will be housed in an ice bath to assure condensation of the moisture from the flue gas stream. Any moisture that is not condensed in the impingers is captured in the silica gel. Moisture content is determined by weighing the various sample fractions.

### 3.4.5 Particulate Matter Emissions – USEPA Method 5

The sampling and analytical procedures outlined in USEPA Method 5 will be used to determine particulate matter in the stack gas during Conditions 1, 2A, and 3A. The sampling train will consist of a glass/quartz fiber filter, two impingers each containing 100 mL of de-ionized water, an empty impinger, and an impinger containing at least 250 grams of silica gel.

All sampling train components will be constructed of materials specified in the method and will be cleaned and prepared per method specifications prior to testing. A minimum sample volume of 45 dry standard cubic feet (dscf) will be collected over a minimum of 120 minutes. The probe and filter temperatures will be maintained between 223 degrees Fahrenheit (°F) and 273°F. The sampling runs will be performed within  $\pm 10$  percent of isokinetic conditions.

Sample recovery procedures will follow those outlined in the test method. Recovery of the USEPA Method 5 sampling train will result in two sample fractions. Sample fractions are listed in Table 3-1. The filter fraction will be packaged in a Petri dish for shipment. The rinse fraction will be collected in a glass jar and returned to METCO's laboratory for analysis. Impinger contents will be measured gravimetrically to determine moisture content and will be archived.

A field blank will be recovered at the end of the testing program along with blanks of each reagent used at the test site.

A diagram of the sample system is presented as Figure 3-4.

### 3.4.6 Toluene Emissions – SW-846 Method 0030

SW-846 Method 0030 Volatile Organic Sampling Train (VOST) will be used to sample stack emissions for determination of the chosen principle organic hazardous constituent (POHC) – toluene – during Conditions 1, 2A, 2B, 3A, and 3B.

The VOST system draws effluent stack gas through a series of sorbent traps. The first trap will contain Tenax™ resin, and the second will contain a section of Tenax™ followed by a section of activated charcoal. A water-cooled condenser will be arranged so that condensate will drain vertically through the traps. New Teflon sample transfer lines will be used, and the sampling train will use greaseless fittings and connectors. The Tenax™ resin will be cleaned and tested prior to testing according to the QA requirements of the method. The Tenax™ tubes for each test condition, including the QC samples for the condition, will all originate from the same cleaning lot.

Sampling will take place for 160 minutes per test run. Sampled gas will be passed through each pair of traps for 40 minutes. Four pairs of traps will be collected per run. One sample of condensate will be collected per VOST sampling run (four pairs). Three of the four pairs of VOST tubes will be analyzed for each run. The fourth will be archived and analyzed if any of the other three tube sets cannot be analyzed. The VOST probe will be kept at or above 130 degrees Celsius (°C) during sampling. The VOST will be operated at a sampling rate of approximately 0.5 liters per minute (L/min) for a total of 20 L per sample.

Each pair of traps will be analyzed separately to measure VOST breakthrough. Breakthrough is present if the catch on the second tube exceeds 30 percent of the catch on the first tube and is above 75 nanograms (ng).

Extra sorbent cartridges will be taken to the sampling site to serve as field and trip blanks. One pair of VOST tubes, designated as a field blank, will be exposed to the ambient air at the sampling location. The exposure time will correspond to the amount of time required to load and unload a pair of VOST tubes onto the sampling train. The tubes will be collected and recovered for each run.

A diagram of the sample system is presented in Figure 3-5.

### **3.5 Continuous Emissions Monitoring**

BASF's continuous emission monitoring systems (CEMS) will be used during the trial burn to determine the concentrations of carbon monoxide (CO) and oxygen in the stack gas. Additionally, the stack sampling contractor will provide a total hydrocarbon (THC) CEMS to collect informational data on the THC concentration in the stack gas. The THC data will not be used for any RCRA compliance demonstrations and, consequently, will not be included in the Trial Burn Report. A discussion on each of the monitors is provided in the sections that follow.

#### **3.5.1 Carbon Monoxide**

The CO in the stack gas emissions will be determined using BASF's non-dispersive infrared (NDIR) analyzers. Each analyzer is configured for dual-range measurement, with the low range having a span of zero to 200 ppmv, and the high range having a span of zero to 3,000 ppmv. The Amines Boiler utilizes a Thermo Environmental Model 48H analyzer. Both utility boilers employ Horiba ENDA 1250 units.

### **3.5.2 Oxygen**

The oxygen concentration in the stack gas emissions will be measured using BASF's paramagnetic oxygen analyzers. Each analyzer is configured for a range of zero to 25 percent. The Amines Boiler utilizes a Servomex Model 1420B analyzer. Both utility boilers employ Horiba ENDA 1250 units.

### **3.5.3 Hydrocarbons**

METCO will supply a THC CEMS to measure the THC concentration in the boiler stack gases. These measurements are being used for informational purposes only, not RCRA compliance demonstrations. METCO's CEMS includes a JUM Model VE7 THC analyzer. The span on the analyzer will be calibrated to match the expected THC concentrations in the stack gas.

## **3.6 Sampling Quality Control Procedures**

Specific sampling QC procedures will be followed to ensure the production of useful and valid data throughout the course of this test program.

Prior to the start of testing, all sampling equipment will be thoroughly checked to ensure clean and operable components and ensure that no damage occurred during shipping. Once the equipment has been set up, the manometer used to measure pressure across the pitot tube will be leveled and zeroed and the number and location of all sampling traverse points will be checked.

To ensure that the sampling trains are free of contamination, all glassware will remain sealed until assembly of the sampling train. The trains will be assembled in a clean environment, free of uncontrolled dust.

At the start of each test day and throughout the testing, all sample train components will be checked to ensure they remain in good condition and continue to operate properly. Electrical components will be checked for damaged wiring or bad connections. All glassware will be inspected to make sure no cracks or chips are present. Care will be taken to make sure that all sampling trains are being operated within the specifications of their respective method. At the end of testing each day, all sampling equipment will be sealed and covered to protect from possible contamination and weather damage.

Figure 3-1  
Amines Boiler Stack Diagram

Traverse Point	Distance from Inside Wall (inches)
1	0.37
2	1.23
3	2.26
4	3.77
5	7.90
6	9.40
7	10.44
8	11.29

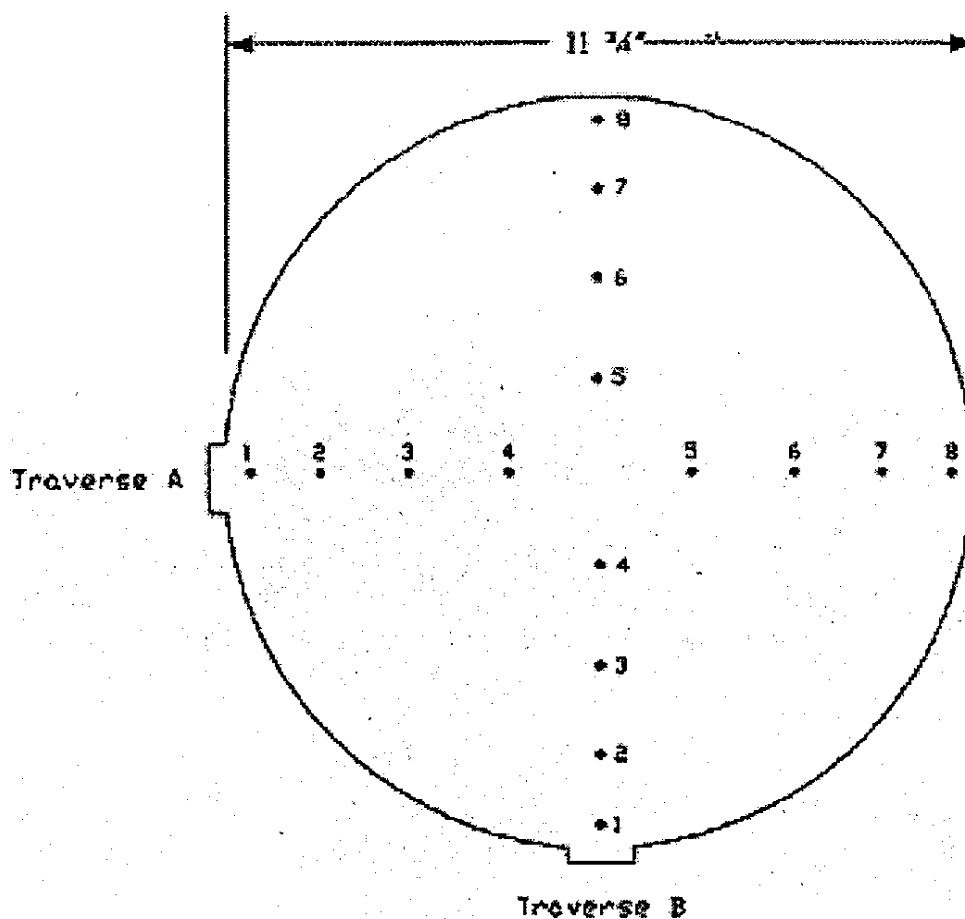


Figure 3-2  
Utility Boiler No. 3 Stack Diagram

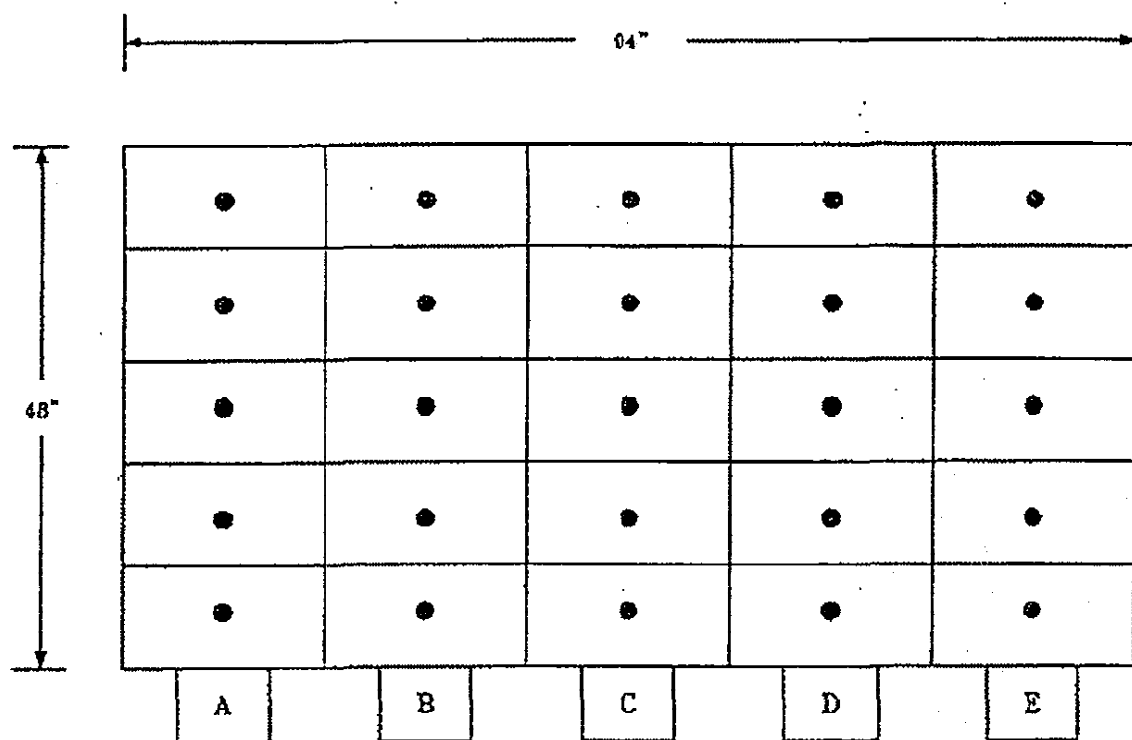


Figure 3-3  
Utility Boiler No. 6 Stack Diagram

Traverse Point	Distance from Inside Wall (inches)
1	2.02
2	6.43
3	11.33
4	15.99
5	24.00
6	34.18
7	61.82
8	72.00
9	79.01
10	84.67
11	89.57
12	93.98

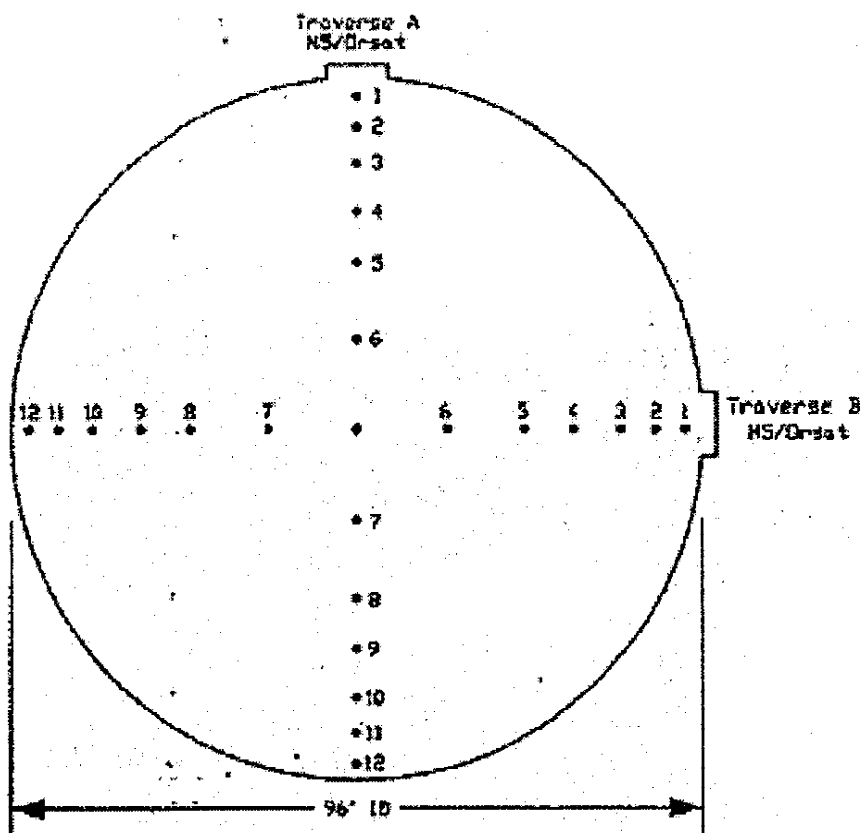


Figure 3-4  
USEPA Method 5 Sampling Train

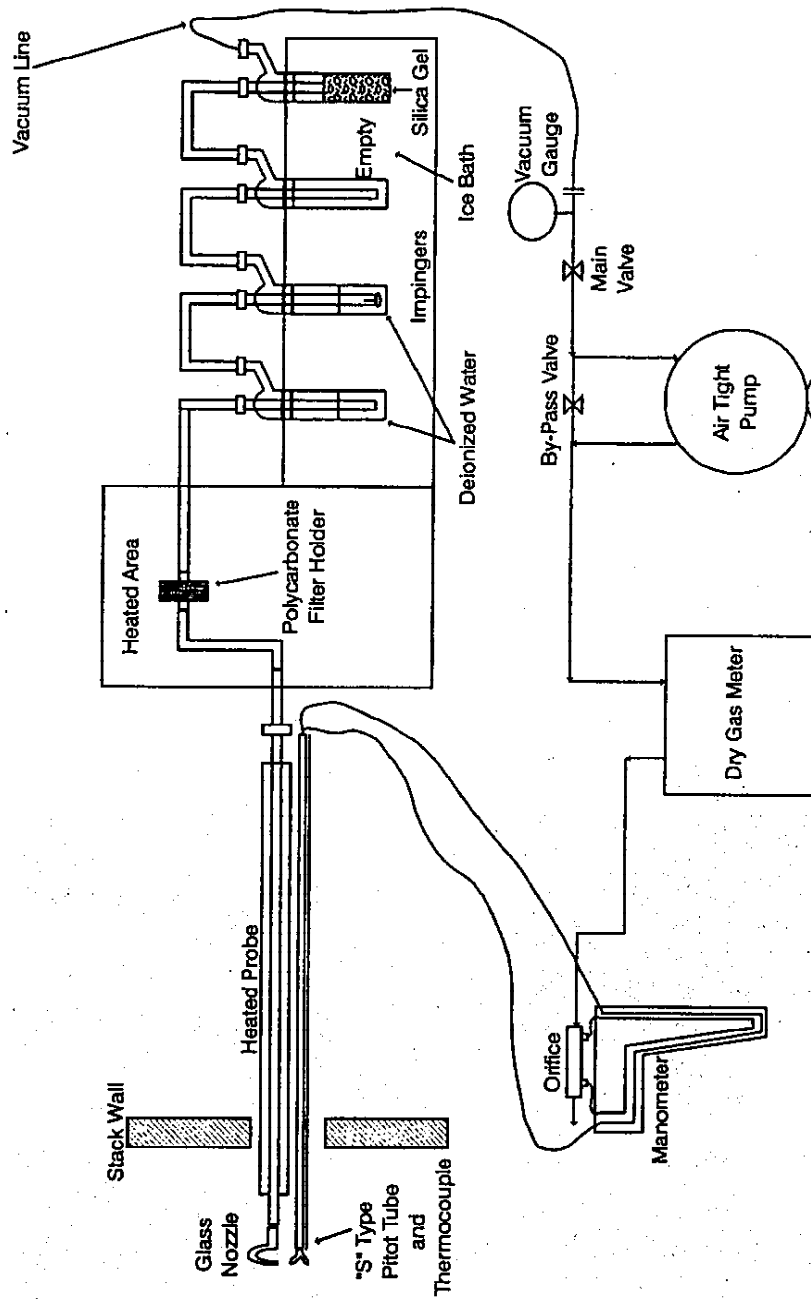
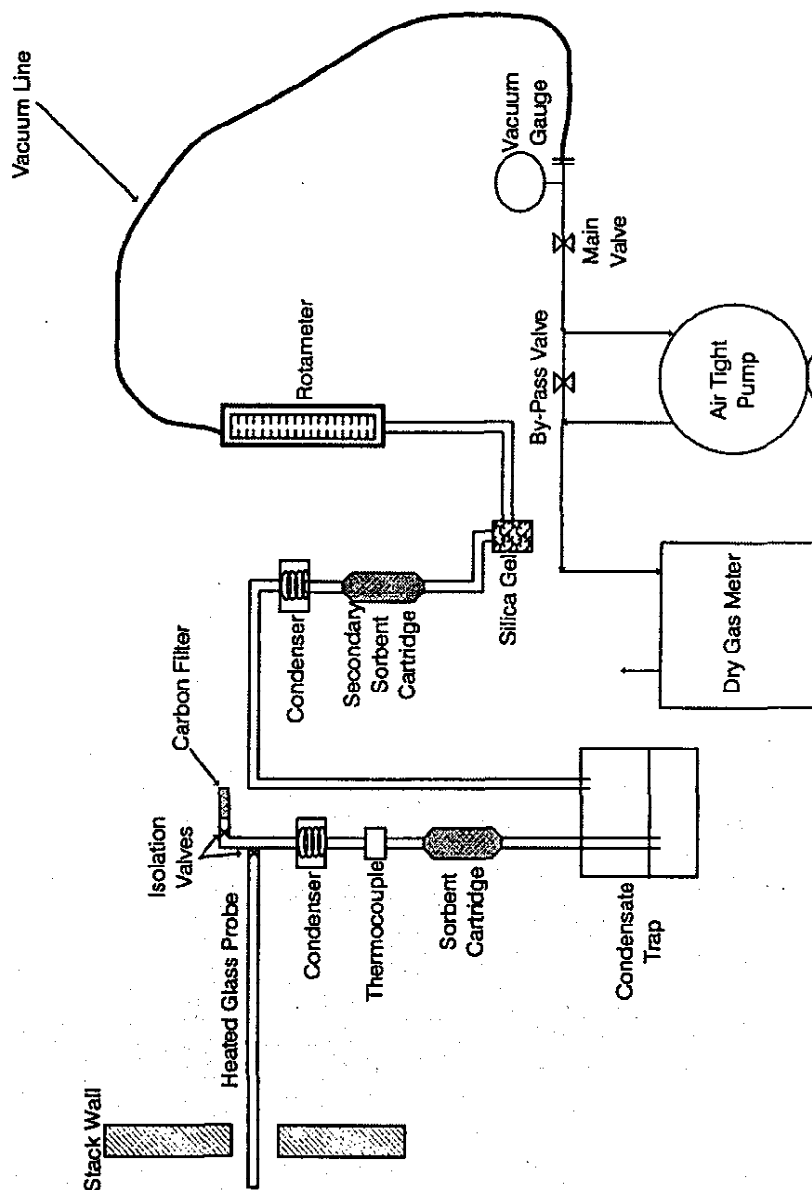


Figure 3-5  
SW-846 Method 0030 Sampling Train



compliance. These tables list the parameter of analysis, QC parameter, QC procedure, frequency at which accuracy and precision are determined, and the QC objective.

**Table 6-1**  
**Quality Control Objectives for Waste Feed Samples**

Analytical Parameters	QC Parameter	QC Procedure	Frequency	Objective <sup>1</sup>
Higher heating value	Precision	Field duplicate	1 per unit	<20% RPD <sup>3</sup>
Specific gravity	Precision	Field duplicate	1 per unit	<20% RPD
Ash	Precision	Field duplicate	1 per unit	<20% RPD
Toluene (POHC)	Accuracy	Surrogates	Every sample	50-130% recovery
	Accuracy	MS <sup>2</sup>	1 per condition	50-130% recovery
	Precision	Surrogate	Calculate RSD for each condition	<35% RSD of recovery
	Precision	MSD <sup>2</sup>	1 per condition	< 50% RPD <sup>3</sup>
	Precision	Field duplicate	1 per unit	<20% RPD <sup>3</sup>

<sup>1</sup> RPD refers to relative percent difference. RSD refers to relative standard deviation.

<sup>2</sup> MSs are not applicable on samples with greater than 0.1% of the target analyte.

<sup>3</sup> If the concentrations are less than five times the reporting limit, the laboratory will be unable to control these limits.

**Table 6-2**  
**Quality Control Objectives for Stack Gas Samples**

Analytical Parameters	QC Parameter	QC Procedure	Frequency	Objective
Toluene (POHC)	Accuracy	LCS	Per batch	50-150% recovery
	Accuracy	Surrogates	All samples	50-150% recovery
	Precision	LCSD	Per batch	≤ 25% RPD

### 6.1.1 Precision

Precision is a measure of the reproducibility of results under a given set of conditions. It is expressed in terms of the distribution, or scatter, of replicate measurement results, calculated as the relative standard deviation (RSD) or, for duplicates, as relative percent difference (RPD). RPD and RSD values are calculated using the following equations:

Any errors or omissions in a data package will be identified and accompanied by a discussion of potential impact on the validity of the data package, the conclusions of the report, and the demonstration of performance standards for the consideration and approval of the Louisiana Department of Environmental Quality (LDEQ) and USEPA.

## 6.2 Evaluation of Contamination Effects

Various blanks will be collected throughout the test program to evaluate the effects of contamination on results. Field blanks will be collected and analyzed to evaluate the impact of the sampling train recovery process on test results. Field blanks will be collected for each sampling train at the end of the test program, as noted in Table 6-3. Blank samples of all reagents used in the stack sampling program will also be collected and archived. In the case of VOST analysis, an additional pair of tubes, designated as a trip blank, will be transported to and from the field and otherwise treated as the other cartridges, except that the caps will not be removed. These reagent blanks and trip blanks will only be analyzed in the event of an unsatisfactory field blank result. Method blanks will be analyzed by the respective laboratories to evaluate the cleanliness of sample handling and preparation and overall laboratory practices. All of these blanks provide critical information on the potential contamination that may occur in test program samples. The results of blank analyses can prove very useful when attempting to understand anomalies in data, or generally higher than expected test results.

Since field and reagent blanks cannot be collected for waste samples, the laboratory method blank will be used to determine the effects of contamination for waste analyses. The same criteria will apply to the waste method blanks as the stack method blanks. Table 6-3 provides the type and analysis criteria for each stack blank to be analyzed.

**Table 6-3**  
**Blank Analysis Objectives for Stack Gas Samples**

Analytical Parameters	Blank Type	Frequency	Objective
Toluene (POHC)	Field blank	One per unit	<Reporting limit
	Method blank	One per batch	<Reporting limit
	Trip blank	One per shipment	Archived <sup>1</sup>

<sup>1</sup> Reagent blanks and trip blanks will initially be archived. These blanks will only be analyzed if the field blank indicates possible sample contamination. Possible contamination will be assessed using the objectives for field blanks stated in this table.

(32 to 450°F) using an ASTM mercury-in-glass thermometer as a reference. The calibration is acceptable if the agreement is within  $\pm 1.5$  percent in degrees Rankin (°R) in the temperature range of 50 to 180°F.

#### **7.1.4 Dry Gas Meter and Orifice**

A calibrated wet test meter is used to calibrate the dry gas meter and orifice. The full calibration procedure, which uses both a wet test meter and a reference standard, is used to obtain the calibration factor of the dry gas meter. For the orifice, an orifice calibration factor is calculated for each of the 18 flow settings during a full calibration.

#### **7.1.5 Barometer**

The stack sampling contractor personnel will calibrate the barometer prior to arrival on site against a National Weather Service Station.

#### **7.1.6 Nozzle**

Glass nozzles will be calibrated on site using a micrometer. Eight readings will be taken at quarter turns, followed by two measurements at random. The arithmetic average of the values obtained during the calibration is used.

### **7.2 Continuous Emission Monitors**

Calibration and quality control procedures for the CEMS utilized during this test program will follow facility-specific procedures and USEPA methods, as applicable. A discussion of the procedures that will be followed for each CEMS is provided below.

#### **7.2.1 Carbon Monoxide and Oxygen Analyzers**

BASF's CO and oxygen analyzers will undergo a quarterly calibration error test within four weeks of the trial burn. In between this test and the trial burn, no unplanned maintenance will be performed on the instruments. Additionally, a calibration drift test will be successfully conducted on each analyzer during each day of the trial burn. Copies of the calibration error test and calibration drift test results will be included in the Trial Burn Report.

#### **7.2.2 Total Hydrocarbon Analyzer**

METCO's THC analyzer will be calibrated and maintained in accordance with the procedures described in USEPA Method 25. However, this data will not be used to support the RCRA compliance demonstration and, consequently, will not be included in the Trial Burn Report.

### 7.3 Analytical Equipment

Analytical equipment calibration and quality control procedures and internal quality control checks are included to ensure accuracy of the measurements made by laboratory equipment. Table 7-2 provides a summary of the calibration and quality control checks included for each analytical method for this test program.

**Table 7-2**  
**Summary of Analytical Equipment Calibration and Quality Control Checks**

Parameter	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria
Toluene (POHC)	Initial calibration	Five levels, as per target list	Initially and as needed	≤15% RSD – Linear RF; >15% RSD (M8000b, §7.0); SPCC RRF >0.10 for chloromethane, 1,1-dichloroethane, and bromoform; SPCC RRF >0.30 for chlorobenzene, and 1,1,2,2-tetrachloroethane; CCC <30% RSD
	Continuing calibration	Continuing calibration verification (CCV)	Every 12 hours following tune as required	SPCC RRF >0.10 for chloromethane, 1,1-dichloroethane, and bromoform; SPCC RRF >0.30 for chlorobenzene, and 1,1,2,2-tetrachloroethane; CCC <20% RSD
	Consistency in chromatography	Internal standards	Every sample and standard	+/- 30 seconds (RT) and 50-200%R

### 7.4 Waste Spiking Equipment

B3 will perform a calibration check for the spiking equipment using their SOP prior to and following the trial burn testing on each boiler. The SOP is provided as Attachment 5.

### 7.5 Preventative Maintenance

To ensure the quality and reliability of the data obtained, preventative maintenance is performed on the sampling and analytical equipment. The following sections outline those procedures.

#### 7.5.1 Sampling Equipment

METCO minimizes the potential impact of equipment malfunction on data completeness through two complimentary approaches. First, an in-house equipment maintenance program is part of routine operations. The maintenance program's strengths include:

- Availability of personnel experienced in the details of equipment maintenance and fabrication;
- Maintenance of an adequate spare parts inventory; and
- Availability of tools and specialized equipment.

For field equipment, preventive maintenance schedules are developed from historical data. Table 7-3 gives specific maintenance procedures for field equipment. Maintenance schedules for major analytical instruments (e.g., balances, GCs) are based on manufacturer's recommendations.

**Table 7-3**  
**Maintenance Activities For Field Sampling Equipment**

Equipment	Maintenance Activities	Spare Parts
Vacuum system	Before and after field program: 1) Check oil and oiler jar. 2) Leak check. 3) Vacuum gauge is functional. Yearly or as needed: 1) Replace valves in pump.	Spare fluid
Inclined manometer	Before and after each field program: 1) Leak check. 2) Check fluid for discoloration or visible matter. Yearly or as needed: 1) Disassemble and clean. 2) Replace fluid.	Spare fluid, o-rings
Dry gas meter	Before and after each field program: 1) Check meter dial for erratic rotation. Every 3 months: 1) Remove panels and check for excessive oil or corrosion. 2) Disassemble and clean.	None
Nozzles	Before and after each test: 1) No dents, corrosion or other damage. 2) Glass or quartz nozzles, check for chips and cracks.	Spare nozzles
Diaphragm pump	Before and after each test: 1) Leak check. Change diaphragm if needed.	None
Orsat analyzer	Before each test: 1) Leak check. 2) Inspect for damage.	Reagents, reservoirs
Tedlar bags	Before each test: 1) Leak check. 2) Inspect for damage.	Spare bags
Miscellaneous	---	Fuses, fittings, thermocouples, thermocouple wire, variable transformers.

### 7.5.2 Analytical Equipment

In addition to including quality control checks in the analysis of test program samples, the laboratories also perform regular inspection and maintenance of the laboratory equipment. Table 7-4 lists some of the routine maintenance procedures associated with the analytical equipment to be used in this test program.

**Table 7-4**  
**Maintenance Activities for Analytical Equipment**

Parameter	Equipment	Maintenance Procedures
Toluene (POHC)	GC/MS	<ul style="list-style-type: none"><li>▪ Clean source, trap, injector, seal and transfer line</li><li>▪ Change sparge vessel, filament and septa</li><li>▪ Change pump oil</li></ul>
Higher heating value (waste samples only)	Bomb calorimeter	<ul style="list-style-type: none"><li>▪ Replace o-rings, as necessary</li></ul>



## **Attachment 3**

# **Project Team Resumes**

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**Dana Scott**  
**Statement of Qualifications for BASF BIF Trial Burns**  
**December 5, 2006**

<b>EDUCATION</b>	LOUISIANA STATE UNIVERSITY, Baton Rouge, LA MASTER OF SCIENCE: Biological & Ag. Engineering SPECIALIZATION: Environmental Engineering	December 2000
	LOUISIANA STATE UNIVERSITY, Baton Rouge, LA BACHELOR OF SCIENCE: Biological Engineering MINOR: Environmental Engineering	May 1996
<b>LISCENSURE</b>	E.I.T./E.I.: Louisiana Board of Registration for Professional Engineers	June 1996
<b>WORK HISTORY</b>	BASF Corporation, Geismar, LA	March 2004 – Present
	Vulcan Chemicals, Geismar, LA	January 2000 – March 2004
	Motiva Enterprises LLC - Convent Refinery, Convent, LA	September 1998 – January 2000
	Radian International LLC (now URS), Baton Rouge, LA	March 1998 – September 1998
<b>RELATIVE EXPERIENCE</b>	<ul style="list-style-type: none"> <li>• Managed Title V, RCRA, LPDES, HON Subparts F&amp;G (SOCMI), HON Subpart H (Equipment Leaks), NESHAP Subpart F (Vinyl Chloride), NSPS Subparts Db and GG, NSPS Subpart FF (Benzene Waste NESHAPS), NSPS Subpart Kb, NSPS Subpart QQQ (VOC Emissions from Refinery Waste Water), Hazardous Waste Combustion (HWC) MACT, HCL MACT, and Polyol Polyether MACT compliance programs at Motiva Enterprises, Vulcan Chemicals and/or BASF Corp.</li> <li>• Completed TSCA permit renewal for halogen acid furnace for Vulcan.</li> <li>• Prepared RCRA Waste Analysis Plans (WAP) for Vulcan and BASF.</li> <li>• Prepared multiple major Title V permit applications for Vulcan and BASF.</li> <li>• Prepared and negotiated final LPDES permit for Vulcan.</li> <li>• Oversaw multiple stack tests of flares, catalytic oxidizers, thermal oxidizers, gas turbines and boilers for Vulcan and/or BASF.</li> <li>• Oversight of HWC MACT compliance for Aniline Incinerator at BASF including: <ul style="list-style-type: none"> <li>✓ Preparation of semiannual reports and ongoing compliance review</li> <li>✓ Oversight of quarterly ACAs and annual RATA</li> <li>✓ Maintenance of HWC MACT training module</li> <li>✓ CPTP preparation and oversight of testing, including development of target operating conditions</li> <li>✓ Communication of all requirements to Operations and assistance in setting required AWFCOs</li> <li>✓ Response to CPT Report NODs issued by LDEQ</li> </ul> </li> <li>• Oversight of BIF compliance and Trial Burn planning for Utilities and Amines Boilers at BASF including: <ul style="list-style-type: none"> <li>✓ Technical review, response to, and implementation of RCRA permit conditions</li> <li>✓ Communication of all operating requirements to Operations and assistance in setting required AWFCOs</li> <li>✓ Preparation of Trial Burn Plans and development of target operating conditions</li> <li>✓ Response to all Trial Burn Plan NODs</li> <li>✓ Site manager of all BIF testing</li> </ul> </li> </ul>	



## **S. Heather McHale, P.E.**

*Manager – Combustion Services*

### **Experience**

Heather is a chemical engineer with 16 years of experience in the areas of Maximum Available Control Technology (MACT) permitting, Resource Conservation and Recovery Act (RCRA) permitting, boiler and industrial furnace (BIF) permitting, Commercial and Industrial Solid Waste Incinerator (CISWI) permitting, process design, incineration, air pollution control, air dispersion and deposition modeling, risk assessments, Title V permits, and heat and material balances. Heather has prepared numerous trial burn plans, and she has coordinated trial burn testing for hazardous waste combustion clients. She has provided on-site technical assistance for the startup and shakedown of a hazardous waste incinerator.

Heather serves as project manager on such projects as hazardous waste incinerator and boiler permitting, multipathway risk assessment, hazardous waste combustor (HWC) MACT compliance, and Industrial Boiler MACT compliance. Heather has developed numerous gap analyses, Notifications of Intent to Comply (NICs), comprehensive performance test (CPT) plans and reports, and required operating plans for facilities preparing to comply with HWC MACT. Heather is the primary client contact on all matters for projects and the primary contact in negotiations with regulatory agencies.

### **Key Projects**

#### **Areas of Expertise**

- Hazardous Waste Combustors MACT compliance
- RCRA/BIF trial burns and risk burns
- Industrial Boiler MACT compliance
- CISWI compliance
- Air pollution control design and permitting
- Multipathway risk assessments

#### ***Hazardous Waste Incineration. Honeywell International, Inc., Hopewell Facility (Virginia). Project Manager.***

Provided overall project management duties for the project. The project included engineering and regulatory consulting for a facility that operated a hazardous waste incinerator. Developed a RCRA trial burn plan and risk burn plan for the incineration system. A trial burn was conducted in the fourth quarter of 1998. A risk burn was conducted in the fourth quarter of 1999. Acted as the overall coordinator of trial-burn and risk-burn activities, including the management of the stack sampling contractor and on-site supervision of testing. Developed the Part B Permit renewal application, including a site-specific multipathway risk assessment protocol and report, for submittal to the Virginia Department of Environmental Quality (VDEQ). Assisted client with negotiations with the VDEQ throughout the project. Currently assisting Honeywell with all aspects of HWC MACT compliance.

**S. Heather McHale, P.E.***Manager – Combustion Services****Hazardous Waste Incinerator. Bayer MaterialScience, LLC. New Martinsville Facility (West Virginia). Project Manager.***

Provided overall project management duties for the project. Developed the HWC MACT CPT plan and continuous monitoring systems (CMS) performance evaluation test (PET) plan, coordinate all testing activities, and assist with all regulatory negotiations. The CPT Plan and CMS PET plan were submitted to the West Virginia Division of Environmental Protection (WVDEP) and approved in April 2003. Developed a multipathway risk assessment protocol, in accordance with USEPA guidance. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Prepared the multipathway risk assessment.

***Hazardous Waste Incinerator. PPG Industries, Inc. Lake Charles Facility (Louisiana). Project Manager.***

Provided overall project management duties for the project. Provided consulting services to assist clients in preparing for compliance with the HWC MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the two liquid injection hazardous waste incinerators into compliance with the regulations. Developed a combined HWC MACT CPT plan and RCRA trial burn/risk burn plan for the incinerators. Also developed a CMS PET plan and all of the operating plans required by HWC MACT. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Will continue to assist with regulatory negotiations throughout the permitting process.

***Hazardous Waste Incinerator. Asahi Glass Fluoropolymers USA, Inc. Bayonne Plant (New Jersey). Project Manager.***

Provided consulting services to assist client in preparing for compliance with the HWC MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the hazardous waste incinerator into compliance with the regulations. Developed the CPT plan and CMS PET plan and all of the operating plans required by HWC MACT. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Will continue to assist with regulatory negotiations throughout the permitting process.

***Hazardous Waste Incinerator. Syngenta Crop Protection, Inc. St. Gabriel Facility (Louisiana). Project Manager.***

Provided overall project management duties for the project. Provided consulting services to assist client in preparing for compliance with the HWC



## **S. Heather McHale, P.E.**

*Manager - Combustion Services*

MACT standards. Developed a combined HWC MACT CPT plan and risk burn plan for the rotary kiln incinerator. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report.

### ***Hazardous Waste Incinerators. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). Various Locations. Project Manager***

Provided overall project management duties for the project. Provided regulatory support for HWC MACT projects for APE 1236M2 deactivation furnaces operated at various U.S. Army facilities, including Tooele Army Depot (TEAD) in Tooele, Utah, McAlester Army Ammunition Plant (MCAAP) in McAlester, Oklahoma, and Crane Army Ammunition Activity (CAAA) in Crane, Indiana. Prepared the required operating plans for each facility, including the feedstream analysis plan, the startup, shutdown, and malfunction (SSM) plan, the operation and maintenance plan, and the continuous monitoring systems (CMS) performance evaluation plan. Provide oversight during the CPTs and developed the CPT reports.

### ***Deactivation Facility Thermal Treatment Unit. Advanced Environmental Technology, Inc. Iowa Army Ammunition Plant. Project Manager.***

Provided overall project management duties for the project. Provided consulting services to assist client with compliance with RCRA Subpart X requirements. Prepared a trial burn/risk burn plan for a thermal treatment unit located at AET's Deactivation Facility operated at the Iowa Army Ammunition Plant (IAAAP) and assisted with regulatory negotiations to obtain USEPA-approval of the plan. Organized, coordinated, and provided oversight for the trial burn/risk burn stack testing. Currently developing the trial burn/risk burn report. Also performing a multipathway risk assessment (MPRA).

### ***Industrial Boilers Burning Hazardous Waste. Bayer CropScience, Institute Plant (West Virginia). Project Manager***

Provided overall project management duties for the project. The project work included engineering and regulatory consulting for a facility that operates three hazardous waste-burning boilers. Developed a RCRA trial burn/risk burn plan for the boilers. A mini-burn and trial burn/risk burn were conducted 2004. Developed the trial burn/risk burn report for submittal to WVDEP. Developed a multipathway risk assessment protocol and report. Assisted the client in negotiations with the WVDEP throughout the project.

**S. Heather McHale, P.E.***Manager - Combustion Services****Industrial Boilers Burning Hazardous Waste. Lonza, Inc., Bayport Plant (Texas). Project Manager***

Provided overall project management duties for the project. The project work included engineering and regulatory consulting for a facility that operates three hazardous waste-burning boilers. Developed a RCRA trial burn/risk burn plan and a mini-burn plan for the boilers. Mini-burn and trial burn were conducted in 1999/2000. Acted as the coordinator of stack test activities, including the management of the stack sampling contractor and the on-site supervision of testing. Developed the Part B Permit Application for submittal to the Texas Natural Resource Conservation Commission (TNRCC). Assisted the client in negotiations with the TNRCC throughout the project.

***Industrial Boilers Burning Hazardous Waste. Huntsman Corporation, Port Neches Facility (Texas). Project Manager.***

The work included engineering and regulatory consulting for a facility that operates four hazardous waste-burning boilers. Developed two RCRA trial burn/risk burn plans and a mini-burn plan for the boilers. Mini-burns and trial burns were conducted in 1999. Acted as the overall coordinator of stack test activities, including the management of the stack sampling contractor and on-site supervision of testing. Assisted the client in negotiations with the TNRCC throughout the project.

***Industrial Boiler MACT Applicability and Compliance Evaluation. Pulp and Paper Facilities (Multiple Locations). Project Manager.***

Provided overall project management duties for the projects. The project included engineering and regulatory consulting for company with multiple facilities that operate solid fuel-fired industrial boilers. Provided consulting services to assist clients in preparing for compliance with the Industrial Boiler MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the units into compliance with the new regulations. The gap analysis included an applicability determination, an evaluation of available emission data to determine compliance with emission standards, and a review of the monitoring, reporting, and record keeping requirements.

***Hazardous Waste Incineration. Confidential Client (Mexico). Project Manager.***

Provided overall project management duties for the project. Project work included engineering and regulatory consulting for a facility that operated two hazardous waste incinerators. Prepared a detailed engineering review, including recommendations for system modifications. Prepared specifications

**S. Heather McHale, P.E.***Manager – Combustion Services*

for equipment modifications. Developed a RCRA-type trial burn plan for the incineration systems. A trial burn was conducted in the fourth quarter of 1996. This was the first test burn of this type to be conducted in Mexico. Acted as the overall coordinator of trial burn activities, including the management of the stack sampling contractor and the on-site supervision of testing. Assisted the client in negotiations with the Mexican regulatory agencies.

***Commercial Hazardous Waste Incineration System. Laidlaw Environmental Services, Inc., Clive Incineration Facility (Utah). Process Engineer.***

Developed a RCRA trial burn plan for a commercial hazardous waste incineration system. Developed multiple test conditions to demonstrate the maximum capacity of the system and to provide flexible permit conditions. Provided on-site technical assistance for the incinerator during the startup/shakedown period. Prepared mini-burn plans and reports. Worked with a computer process data retrieval system to provide operational data for mini-burn and trial-burn testing. Used computer simulations as a tool in troubleshooting the incinerator's performance.

***Reasonable Available Control Technology Determination and Compliance Plan. Metals Recovery Facility (Pennsylvania). Project Manager.***

Prepared a Reasonable Available Control Technology (RACT) Determination and Compliance Plan for a high-temperature metals recovery facility. The facility was identified as a major source of nitrogen oxide and volatile organic compounds (VOCs). The work included a site survey to conduct an emission inventory and to collect design and operating data. Calculated the actual and potential emissions on an hourly and annual basis for each source. Identified and qualified *de minimis* VOC sources. Identified, qualified, and described all of the applicable VOC control technologies for each source. Prepared detailed cost estimates of each technically feasible control technology and RACT cost analysis to determine the most cost-effective control for each source. The RACT plan was accepted as administratively and technically complete by the Pennsylvania Department of Environmental Protection (PA DEP). An operating permit was issued to the facility based on the RACT determination and compliance plan.

***Title V Permitting. Multiple Facilities (Delaware, Illinois, Kentucky, New Jersey, New York, Pennsylvania, and Wisconsin). Project Engineer.***

Prepared Title V permit applications for facilities in Delaware, Illinois, Kentucky, New Jersey, New York, Pennsylvania, and Wisconsin. Sources permitted included high-temperature metal recovery facilities, grey iron and steel foundries, metal coating operations, rotogravure printing operations, resin

**S. Heather McHale, P.E.***Manager - Combustion Services*

manufacturers, and a specialty paper coating manufacturer. The work for each permitting project included a site survey to conduct an emission inventory and to collect existing facility design, permitting, and operating data. Conducted a database and literature search to determine emission and control efficiency factors. Calculated the actual and potential emissions on an hourly and annual basis. Prepared a detailed description of facility operations and each emission source, including process flow diagrams. Determined the applicable regulatory requirements for the facilities, and performed compliance audits. Completed all the required state permit forms for the facility, and for each source, stack, piece of control equipment, and emission/process monitor.

***Computer Program Development: Incineration and Air Pollution Control Performance Prediction and Incineration System Design, Emission Inventories for Clean Air Act Applications, and Multipathway Risk Assessment for Hazardous Waste Combustors.***

Developed several computer programs for the prediction of incineration and air pollution control system performance. Developed the computer programs used to size incineration systems, to determine emissions from systems, and to establish operating parameters for systems. Developed a computer program for emission inventories for Reasonable Available Control Technology and Title V projects. The program is used to calculate actual and potential emissions for criteria pollutants, as well as for hazardous air pollutants, on both an hourly and an annual basis. Developed computer program for multipathway risk assessment calculations, following the procedures of USEPA guidance document, *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA530-D-98-001A).

**Education and Training**

B.S., Chemical Engineering, Penn State University, University Park, 1988

Air Emission Dispersion Modeling Workshop

Stack Sampling Workshop

**Affiliations**

American Institute of Chemical Engineers

Air and Waste Management Association



## **S. Heather McHale, P.E.**

*Manager – Combustion Services*

### **Registrations and Certifications**

Registered Professional Engineer – New York and Pennsylvania

### **Publications and Presentation**

Gehring, M. E., McHale, S. H., and Morse, R. D. 2004. "EHS Management Systems and HWC MACT Compliance." Presented at the 23rd International Conference on Incineration and Thermal Treatment Technologies. May 2004. Phoenix, Arizona.

McHale, S. H. and Gehring, M. E. 2003. "HWC MACT from NIC to NOC - An Industry Survey." Presented at the 22nd International Conference on Incineration and Thermal Treatment Technologies. May 2003. Orlando, Florida.

McHale, S. H. and Gehring, M. E. 2002. "Workshop: Startup, Shutdown, and Malfunction Plans for Hazardous Waste Combustors." Presented at the 21st International Conference on Incineration and Thermal Treatment Technologies. May 2002. New Orleans, Louisiana.

McHale, S. H. and Budin, M. "Comparative Analysis: RCRA Trial Burn & HWC MACT Comprehensive Performance Test." Presented at the 2002 AWMA Hazardous Waste Combustor Specialty Conference. April 2002. St. Louis, Missouri.

Tidona, R. J. and McHale, S. H. "The HWC MACT Rule: What Does It Mean To Me?" Presented at the 16th International Conference on Incineration and Thermal Treatment Technologies. May 1997. Oakland, California.

Contributing author on "Introduction to Hazardous Waste Incineration," Second Edition, Section 3: Standards and Regulations, published in 2000.



## THOMAS 'Blair' SHIELDS; Project Supervisor II

### Education

B.S. Environmental Science, May 18, 1990; Concordia College, Bronxville, New York.

### Technical Experience

Participated in the sampling of over 250 emission test programs (20 of which were trial burns of RCRA-permitted sources). Served as the Project Supervisor for more than 100 emission test programs, including several high profile projects within the chemical and petrochemical industry where emission data was used for dispersion modeling and risk assessment purposes. Additionally, Blair has functioned as a Project Supervisor on projects requiring subcontractor support for spiking and EPA Method 18 analysis. Specifically, Blair has an established relationship with Field Portable Analytical, METCO's proposed EPA Method 18 subcontractor.

Emission testing experience includes project assignments in various industries such as:

- Power generation
- Petrochemical
- Synthetic Organic Chemical Manufacturing
- Chemical
- Pulp and paper
- Food
- Hazardous Waste Incineration

Tested sources include:

- Incinerators and Flares
- Thermal and Catalytic Oxidizers
- Wet and Dry Scrubbers of Various Designs
- Electrostatic Precipitators
- Turbines
- Boilers

(continued)



SHIELDS, Blair (cont'd)

Technical  
Experience  
(cont'd)

- Process Vents in chemical, petrochemical, pulp and paper industries.
- Batch, Continuous, and Semi-continuous purposes.
- Data generated from these test programs has been used to:
  - Demonstrate compliance with permit conditions.
  - Support revisions of permit conditions
  - Validate continuous emission monitor and control device performance.
  - Support design of control devices
  - Support in-house engineering and evaluation projects

Thoroughly trained and experienced in the following EPA Methods:

- CFR Title 40, Chapter 1, Part 60, EPA Methods 1 through 17, 20, 23, 25A, 26A, and 29
- Methods 0010, 23A, 0030, 0060, and 0061
- Particle Size Distribution Analysis

Has performed on-site analysis for gravimetric particulate, sulfur trioxide (SO<sub>3</sub>) and sulfur dioxide (SO<sub>2</sub>).

Experienced in the sampling of commercial calibration gas cylinders for sulfur dioxide, oxides of nitrogen, carbon dioxide, oxygen, and carbon monoxide.

(continued)



SHIELDS, Blair (cont'd)

Technical  
Experience  
(cont'd)

Thoroughly trained in the operation and routine maintenance of the following:

- Thermo Environmental Model 10S Oxides of Nitrogen Analyzer
- Thermo Environmental Model 48 Carbon Monoxide Analyzer
- Teledyne Model 326 Oxygen Analyzer
- Western Research Model 721M Sulfur Dioxide Analyzer
- Horiba Model PIR 2000 Carbon Dioxide Analyzer
- J.U.M. Model VE-7 Total Hydrocarbon Analyzer
- ESC Data Acquisition System

Thoroughly trained in the calibration techniques for all field testing equipment.

Professional  
Training  
Courses

Attended 40-hour Occupational and Environmental training program on Hazardous Materials (CFR 1910.120) in Baton Rouge, Louisiana, March of 1999.

Also attended an 8-hour refresher course for CFR 1910.120 (given annually).



JERVEY C. CHEVEALLIER; Manager, Baton Rouge Operations

Education

B.S. in Wildlife and Fisheries, 1994; Louisiana State University; Baton Rouge, Louisiana.

Professional  
Training  
Courses

Attended 40-hour Occupational and Environmental training program on Hazardous Materials (CFR 1910.120) in Baton Rouge, Louisiana, March of 1999.

Also attended an 8-hour refresher course for CFR 1910.120 (given annually).

Technical  
Experience

Participated in the sampling of over 500 sources (50 of which were trial burns). Serving in the supervisory capacity of over 300 sources, including several of which were sampled simultaneously using more than one sampling train.

Thoroughly trained in all EPA testing procedures, 1996-present.

Testing experience in various industries such as:

- Power generation,
- Cement,
- Glass,
- Food,
- Oil and gas,
- Pulp and paper,
- Chemical, and
- Incineration

Supervised projects for Owens Brockway in Atlanta, Georgia; First Chemical in Pascagoula, Mississippi; U.S. Alliance in Coosa Pines, Alabama; and Pepperidge Farms in Richmond, Utah.

(continued)



CHEVEALLIER, Jervey (cont'd)

Technical  
Experience  
(cont'd)

Over three years experience with EPA and Texas Air Control Board (TACB) methods of sampling stationary sources.

Thoroughly trained in the following EPA Methods: CFR Title 40, Chapter 1, Part 60, EPA Methods 1 through 17, 20, 23, 25A, 26A, and 29.

Experienced with sampling EPA Methods 0010, 23A, 0030, 0060, and 0061.

Experienced with particle-size sampling with the Andersen impactor method.

Has performed on-site analysis for gravimetric particulate, sulfur trioxide and sulfur dioxide.

Experienced in the sampling of commercial calibration gas cylinders for sulfur dioxide, oxides of nitrogen, carbon dioxide, oxygen, and carbon monoxide.

Thoroughly trained in the operation and routine maintenance of the following:

- Thermo Environmental Model 10S Oxides of Nitrogen Analyzer
- Thermo Environmental Model 48 Carbon Monoxide Analyzer
- Teledyne Model 326 Oxygen Analyzer
- Western Research Model 721M Sulfur Dioxide Analyzer

(continued)



CHEVEALLIER, Jervey (cont'd)

Technical  
Experience  
(cont'd)

- Horiba Model PIR 2000 Carbon Dioxide Analyzer
- J.U.M. Model VE-7 Total Hydrocarbon Analyzer
- ESC Data Acquisition System
- Thoroughly trained in the calibration techniques for all field testing equipment.



ROBERT E. ADAMS, Ph.D.; Project Manager

Education

Ph.D. Analytical Chemistry, 1977; University of Georgia,  
Athens, Georgia.

B.S. Chemistry, 1971; University of North Carolina,  
Chapel Hill, North Carolina.

Professional  
Memberships

American Chemical Society, Analytical Division  
Air and Waste Management Association  
Alpha Chi Sigma

Technical  
Experience

Participated in the sampling of multiple sources, including  
several of which were sampled simultaneously using more  
than one sampling train, from 1990-present.

As a Quality Assurance Director, conducted quality audits,  
implemented new methods, and improved laboratory operations  
for several environmental laboratories. Also, worked to develop  
proposals and review reports.

Supervised the development and reviewed, under stringent quality  
assurance/ quality control (QA/QC), generalized GC, HPLC, and  
GC/MS methods for the analysis of hazardous waste incinerator  
effluents. QA/QC plans were developed to control these  
experiments.

Developed procedures for the analysis of volatile and semi-volatile  
organic compounds as an Organic Lab Manager.

Managed the analysis of hazardous waste samples for EPA's  
Superfund program (2 contracts). This program involved the  
determination of volatiles and base/neutral/acid fractions by  
GC/MS and pesticides by GC/ECD.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Technical  
Experience  
(cont'd)

Thoroughly trained in the operation and routine maintenance of the following:

- Agilent 1090 HPLC
- Agilent 5971 GC/MS
- Agilent 5972 GC/MS
- Agilent 5973 GC/MS
- Agilent 5890 GC/FID/ECD/FPD
- Extractive FTIR
- Shimadzu GC 17 FID
- Shimadzu GC 14 FID/FPD
- Perkin-Elmer A Analyst Graphite Furnace AA
- Leeman Labs DRE ICP-AES
- Dionex 100 Ion Chromatograph

Professional  
Training  
Courses

Attended 40-hour Hazardous Waste Operations and Emergency Response in accordance with 29 CFR 1910.120, Dallas, Texas in February 2004. Also attended 8-hour HAZWOPER refresher course from 2005.

Certifications

Adult CPR certified  
Standard First Aid certified  
HAZWOPER certified

Publications and  
Presentations

Adams, R.E.; Caudle, M.D. *The Use of Portable FTIR for Industrial Gas Analysis and Process Optimization*. Paper presented at the Air and Waste Management Association—Southern Section 2002 Annual Meeting and Technical Conference, Orange Beach, AL; 2002 September 15-18.

Weinberg, D.S.; Adams, R.E.; Manier, M.L. *Software Programs for Processing PCDF/PCDD GC/MS Data*. Paper presented at the 39<sup>th</sup> ASMA Conference on Mass Spectrometry and Allied Topics, Nashville, TN; 1991 May 19-24.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and  
Presentations  
(cont'd)

Weinberg, D.S.; Adams, R.E.; Manier, M.L. *Evaluation of a Particle-Beam Liquid Chromatograph/Mass Spectrometer*. Paper presented at the 39<sup>th</sup> ASMA Conference on Mass Spectrometry and Allied Topics, Nashville, TN; 1991 May 19-24.

Adams, R.E.; Hass, J.R.; Smith, W.S.; Wong, T. *Sampling and Analysis for Volatile and Semivolatile POHC During RCRA Trial Burns: Techniques and Problems*. Proceedings of the 80<sup>th</sup> annual meeting of the Air Pollution Control Association, New York, NY; 1987, June 21-26.

Adams, R.E.; James, R.H.; Burford, L.A.; Miller, H.C.; Johnson, L.D. *Analytical Methods for Determination of POHC in Combustion Products*. Environ. Sci. Technol. 20: 761-769; 1986. Paper presented at the Symposium on Organic Emission from Combustion, 187<sup>th</sup> ACS national meeting; 1984 April; St. Louis, MO.

Adams, R.E.; Thomason, M.M.; Strother, D.L.; James, R.H.; Miller, H.C. *The Determination of PCDDs and PCDFs in PCB Oil From a Hazardous Waste Site*. Paper presented at the 5<sup>th</sup> International Symposium on Chlorinated Dioxins and Related Compounds. Bayreuth, Federal Republic of Germany; 1985, September 16-19. Chemosphere 15: 1113-1121; 1986.

James, R.H.; Adams, R.E.; Johnson, L.D. *A Simplified Sampling and Analysis System for the Determination of Volatile Organic Compounds in Combustion Effluents*. Proceedings of the 79<sup>th</sup> Annual Meeting of the Air Pollution Control Association. Minneapolis, MN; 1986, June 22-27.

James, R.H.; Adams, R.E.; Finkel, J.M.; Miller, H.C.; Johnson, L.D. *Evaluation of Analytical Methods for the Determination of POHC in Combustion Products*. J. Air Pollut. Control Assoc. 35: 959-989; 1985.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and  
Presentations  
(cont'd)

James, R.H.; Adams, R.E.; Thomason, M.M.; Johnson, L.D.  
*Measuring Products of Combustion-Analytical Methods for POHCs  
and PICs.* Proceedings of the Fifth Annual National Symposium on  
Recent Advances in the Measurement of Air Pollutants. Raleigh,  
NC; 1985, May 14-16.

Thomason, M.M.; James, R.H.; Adams, R.E.; Johnson, L.D.  
*Products of Incomplete Combustion-Analytical Methods.*  
Proceedings of the Eleventh Annual Research Symposium on Land  
Disposal, Remedial Action, Incineration, and Treatment of  
Hazardous Waste. Cincinnati, OH; 1985, April 29-May 1.

Adams, R.E. *Positive and Negative Chemical Ionization Pyrolysis  
Mass Spectrometry of Polymers.* Anal. Chem. 55: 414-416; 1983.  
Paper presented at the 33<sup>rd</sup> Southeast regional ACS meeting,  
Lexington, KY; 1981 November.

Adams, R.E. *Pyrolysis Mass Spectrometry of Terephthalate Based  
Polyesters Using Chemical Ionization and Negative Ion Detection.*  
J. Polym. Sci. 20: 119-129; 1982. Paper presented at the  
Southeast-Southwest regional ACS meeting. New Orleans, LA;  
1980 December.

Adams, R.E.; Carr, P.W. *Coulometric Flow Analyzer for Use With  
Immobilized Enzyme Reactors.* Anal. Chem. 50: 944-950; 1978.  
Invited paper at the 11<sup>th</sup> Great Lakes regional ACS meeting.  
Stevens Point, WI; 1977 June.

Adams, R.E.; Betso, S.R.; Carr, P.W. *Electrochemical pH-stat and  
Controlled Current Acid-Base Analyzer.* Anal. Chem. 48: 1989-  
1996; 1976. Paper presented at the 27<sup>th</sup> Pittsburgh Conference on  
Analytical Chemistry and Applied Spectroscopy. Cleveland, OH;  
1976 March.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and  
Presentations  
(cont'd)

Klatt, L.N.; Connell, D.R.; Adams, R.E.; Honigberg, I.L.; Price, J.C.  
*Voltametric Characterization of a Graphite-Teflon Electrode.* *Analy.*  
*Chem.* 47: 2470-2472; 1975.

Adams, R.E. *Development and Application of a Totally*  
*Electrochemical pH-stat and Controlled Current Acid-Base*  
*Analyzer for Biological Studies.* Athens, GA; University of  
Georgia; 1977. 151 p. Dissertation.



## Daniel P. Ealy

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### EDUCATION

A.S. Mechanical Engineering, Penn State University, 1988

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### EMPLOYMENT HISTORY

B3 Systems, Inc., Raleigh, North Carolina. 1993- present.  
U.S. Pollution Control, Inc., Lakepoint, Utah. Process Operator, 1991 - 1993  
Norwood, Inc., Beckley, West Virginia. Sales Engineer, 1990 - 1991

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### RECORD OF EXPERIENCE

**Overview.** Mr. Ealy has experience in hazardous waste incineration, low temperature thermal desorption, waste water treatment, sample collection, preparation and tracking.

**B3 Systems.** *Specific Duties, Responsibilities, and Assignments:* Mr. Ealy provides direct support for B3 Systems field services and equipment maintenance. He is responsible for materials procurement, equipment delivery, and overall project logistics.

**Process Operator, USPCI.** *Specific Duties, Responsibilities, and Assignments:* Mr. Ealy was responsible for a wide variety of project-specific duties for USPCI, as described below.

Mobile Thermal Recycling Unit (MTRU), Union Pacific Railroad, Las Vegas, Nevada. Mr. Ealy was a senior board operator for the MTRU. Responsibilities for this position consisted of supervising a 3-man crew on a 12-hour shift. He also ensured optimum operation of the unit feed rates and stack emissions. Mr. Ealy was responsible for maintaining sampling procedures and ensuring all employees followed sampling guidelines. He was also involved with the shakedown, stack testing and operator training in Las Vegas.

On site Incineration and Source Removal, Laskin Poplar Superfund Site, Ashtabula County, Ohio  
Mr. Ealy operated the Waste Water Treatment Plant. Under his supervision, the facility treated over three million gallons of water in one and a half years. He was also involved with the set-up, de-bugging, daily maintenance, chemical ordering, and chemical storage. As an on-site Sample Director, Mr. Ealy was responsible for ensuring that quality assurance/quality control (QA/QC) procedures as outlined in the Quality Assurance Project Plan (QAPP) were followed.

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**Sales Engineer, Norwood, Inc.** *Specific Duties, Responsibilities and Assignments:* Mr. Ealy coordinated the sale of construction material to the coal industry. While working as a cost estimator, he ensured proper engineering of erosion fence, erosion control block, geo fabric, and corrugated steel pipe installations.

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**PUBLICATIONS AND PRESENTATIONS**

Safety Concerns for Chemical Spiking at Trial Burns, Hazardous Waste Combustion  
Specialty Conference, Dallas, Texas, September 1999, written and co-presented with  
Robert W. Baxter

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**ADDITIONAL TRAINING AND CERTIFICATIONS**

40 Hour OSHA Hazardous Waste Training  
Safety Council Training from various areas  
DOT Hazardous Materials Transportation Training  
DOT Hazardous Materials Waste Shipping

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**Personnel Resume**

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**KEVIN S. WOODCOCK**

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**Qualifications Summary**

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Mr. Woodcock is currently receiving his formal education and training in business management from the University of Phoenix and has been employed in the analytical services field for several years. He is currently a senior level project manager for STL Knoxville. He is a U.S. Army Gulf War Veteran and has received numerous awards and commendations during his distinguished military career.

**Professional Experience**

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**Project Manager II, STL Knoxville**

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STL Knoxville -- Knoxville, TN -- 1998 to Present

Mr. Woodcock coordinates and manages customer's projects through all phases of laboratory operations, ensuring fulfillment of Severn Trent Laboratories' commitments to client requirements, error-free work, and on-time delivery. Maintains communications with clients and Account Executives and serves as a liaison between clients and laboratory operations to meet client needs. He monitors compliance with industry regulations, contractual agreements, program management processes, and program specifications. Creates quotations, and writes and reviews RFP's to obtain potential contracts and coordinates contract negotiations for existing contracts. Generates and reviews final reports to ensure accuracy and facilitates corrective action when needed.

**Sample Coordinator**

Onsite Environmental—Raleigh, NC -- 1997 to 1998

**Aircraft Electrician**

United States Army -- 1994 to 1996

**Infantry / Communication Specialist**

United States Army -- 1990 to 1994

**Education**

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- Currently pursuing a BS in Business Management – University of Phoenix, Arizona – 2003 – Present
- United States Army Aviation Logistics School -- Fort Eustis, Virginia -- 1994
- United States Army Officers Academy – Fort Stewart, Georgia – 1992
- Mont Pleasant High School – Schenectady, New York – 1989

**Professional Training**

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- Customer Service Training, 2004
- Certified Hazardous Waste Operator, OSHA 29 CFR 1910.120 certification, 1997



# **Attachment 4**

## **Example Waste Feed**

### **Sampling Form**

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**Process Sample Field Data Sheet**

Job No.: \_\_\_\_\_  
Sampler: \_\_\_\_\_  
Condition: \_\_\_\_\_  
Run Number: \_\_\_\_\_

Job Name: \_\_\_\_\_  
Date of Sampling: \_\_\_\_\_  
Location: \_\_\_\_\_  
Run Description: \_\_\_\_\_

Sample Identification No.: Liquid Waste Feed    Valve Number: \_\_\_\_\_

Equipment: (2-3) 4 liter sample bottle, (~28) 125 ml Sample Bottles, (~28) VOAs, (4) 500 ml Composite Bottles, (2) 500 ml Beakers, (1) Funnel.

**INSTRUCTIONS**

1. Before the trial burn run starts, clear sampling line by opening the tap and collecting approximately 250 ml of sample into a beaker. Examine sample to assure the liquid is homogeneous (e.g., free from solids, sludge, etc.) and discard into waste container. If not, contact field-sampling crew chief before trial burn starts.
2. At the beginning of the trail burn and every 30 minutes (+/- 5 minutes), open the tap; rinse the two sub-sample containers (125 ml bottles) with approximately 100 ml and discard into the waste container. Open tap and fill the rinsed sub-sample containers and cap. Open the tap and fill the two VOA vials, assuring no head space is present.
3. Record the time, and comments. Discard surplus sample into the waste container.
4. Use Teflon tape to seal VOA cap.
5. Repeat steps 2-4 every 30 minutes of elapsed sampling time for the run (4-5 hour minimum). The timing of the 30-minute intervals is to be suspended whenever sampling is interrupted.
6. At the end of the tests empty 125 ml sub-samples (22-28) into 4-liter jugs and mix for the composite sample. Transfer the composite sample into the appropriate labeled containers; seal with Teflon tape and secure custody seal on composite cap.
7. Following the traceability procedures, ensure that jars are sealed and labeled; and place on ice, and fill out the necessary chain of custody forms.
8. Deliver the samples to the field sample custodian for packaging and shipment.

**Process Sample Field Data Sheet  
For Liquid Waste Feed**

VOA No.	VOA No.	Time of Grab	125 ml No.	125 ml No.	Initials
C R -04233-LW-V-1	C R -04233-LW-V-2		1-1A	1-1B	
C R -04233-LW-V-3	C R -04233-LW-V-4		1-2A	1-2B	
C R -04233-LW-V-5	C R -04233-LW-V-6		1-3A	1-3B	
C R -04233-LW-V-7	C R -04233-LW-V-8		1-4A	1-4B	
C R -04233-LW-V-9	C R -04233-LW-V-10		1-5A	1-5B	
C R -04233-LW-V-11	C R -04233-LW-V-12		1-6A	1-6B	
C R -04233-LW-V-13	C R -04233-LW-V-14		1-7A	1-7B	
C R -04233-LW-V-15	C R -04233-LW-V-16		1-8A	1-8B	
C R -04233-LW-V-17	C R -04233-LW-V-18		1-9A	1-9B	
C R -04233-LW-V-19	C R -04233-LW-V-20		1-10A	1-10B	
C R -04233-LW-V-21	C R -04233-LW-V-22		1-11A	1-11B	
C R -04233-LW-V-23	C R -04233-LW-V-24		1-12A	1-12B	
C R -04233-LW-V-25	C R -04233-LW-V-26		1-13A	1-13B	
C R -04233-LW-V-27	C R -04233-LW-V-28		1-14A	1-14B	

Time of Composite	500 ml Composite Sample No.	Initials
	C R -04233-LW-1/2L-1	

**Remarks:** Two 1/2L composite samples will be archived on-site and two 1/2L composite samples will be sent off for analysis.



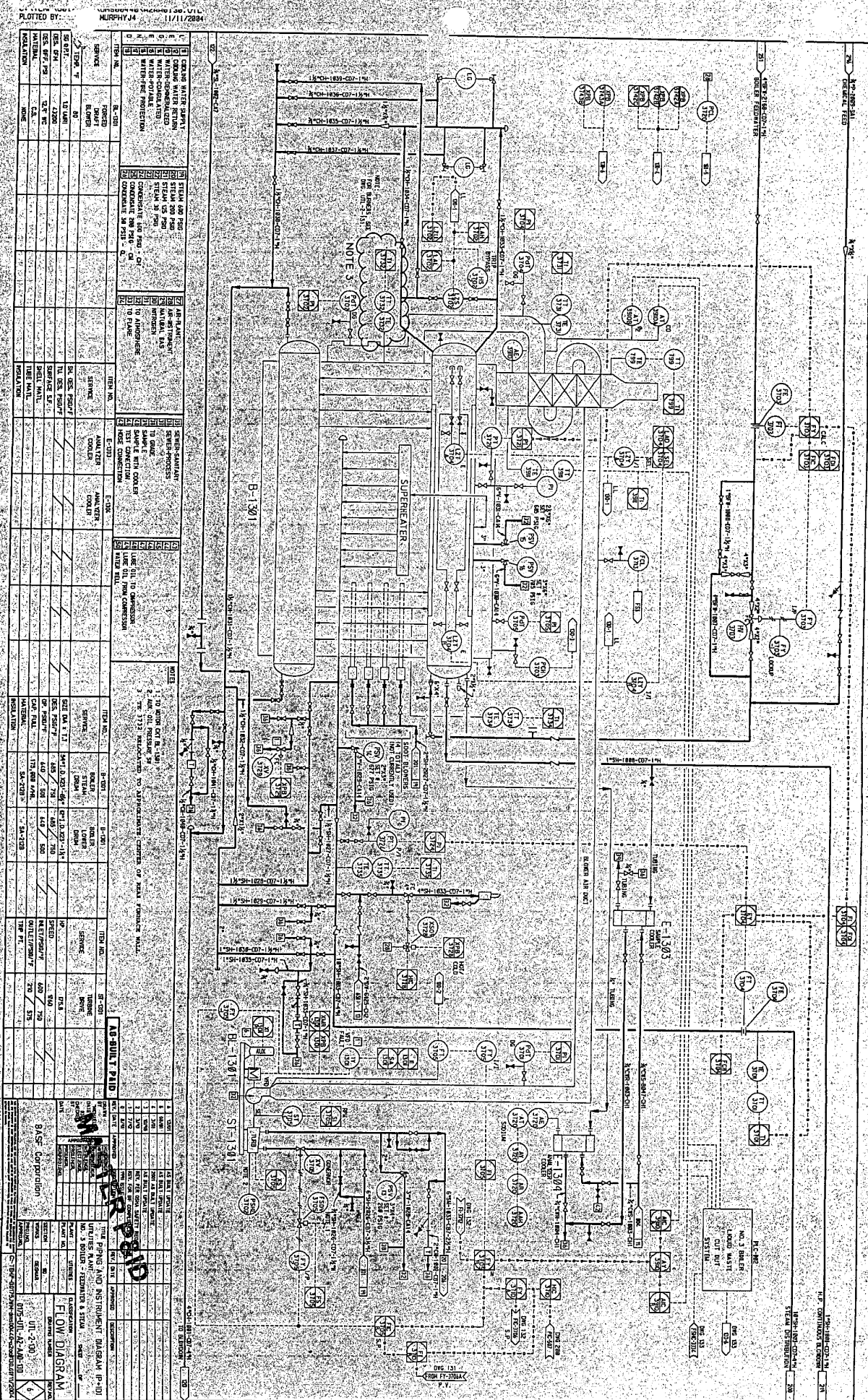
## **Appendix B**

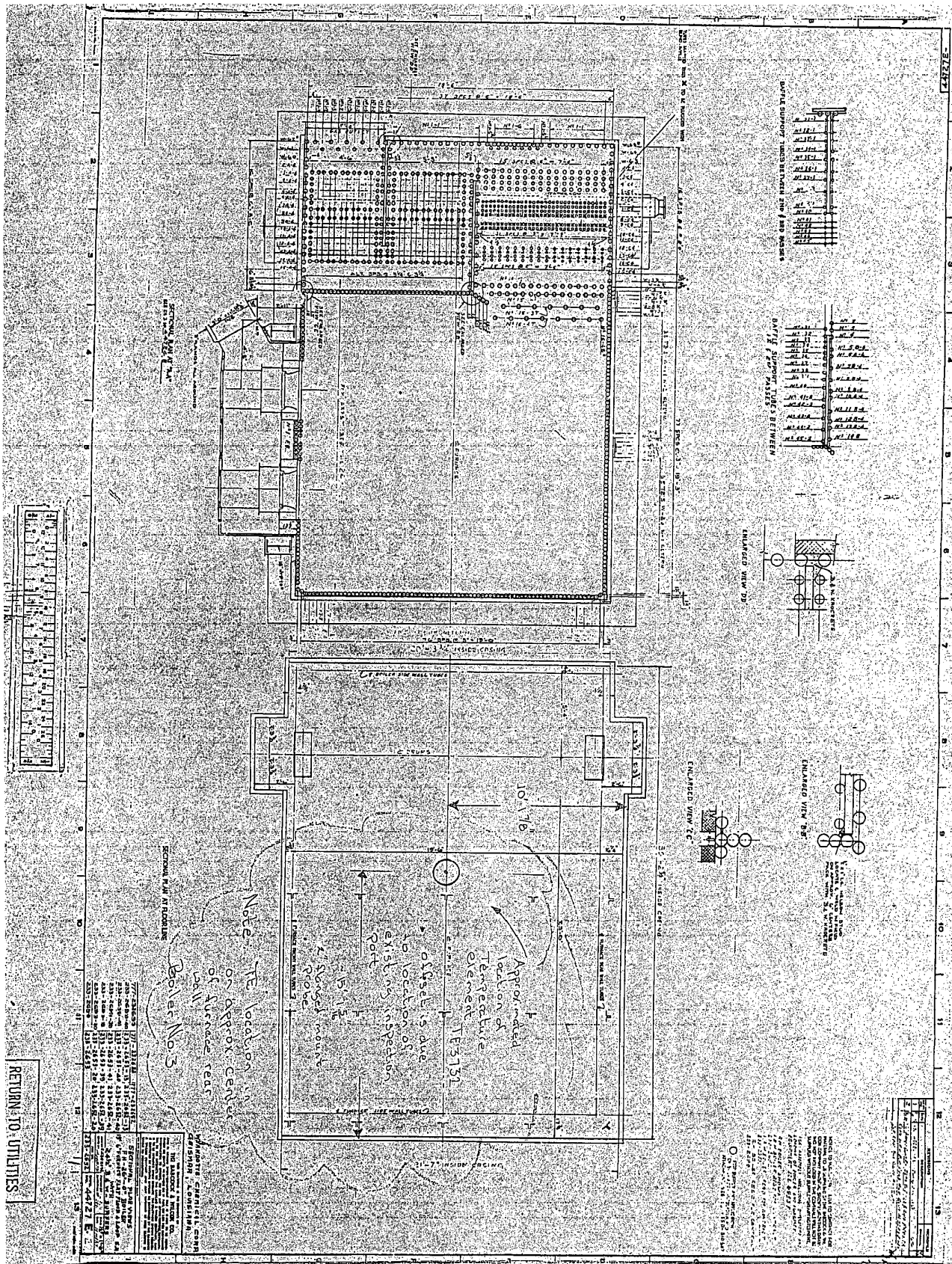
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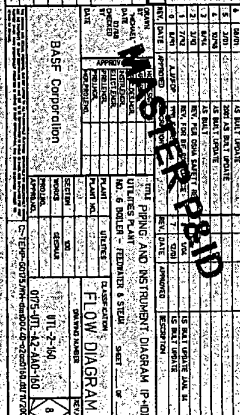
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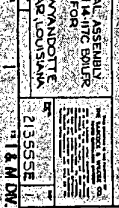
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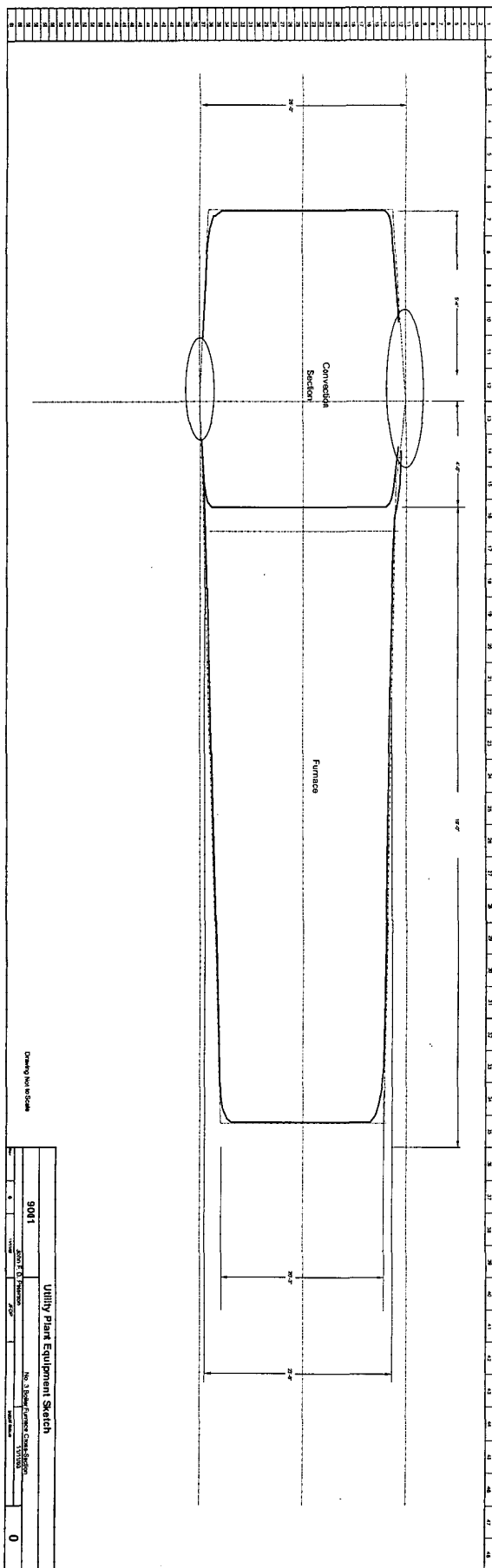


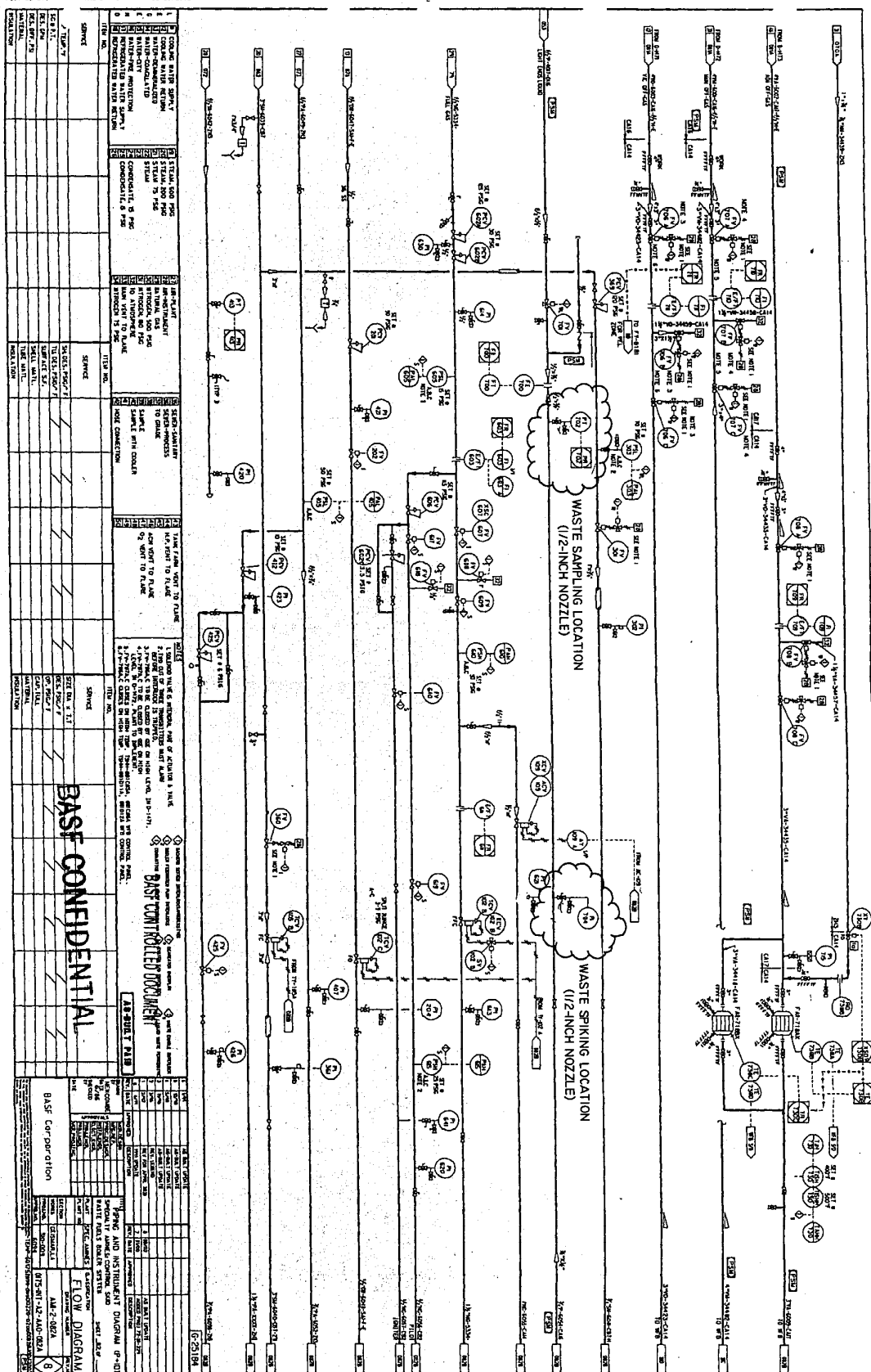
RETURN TO UTILITIES





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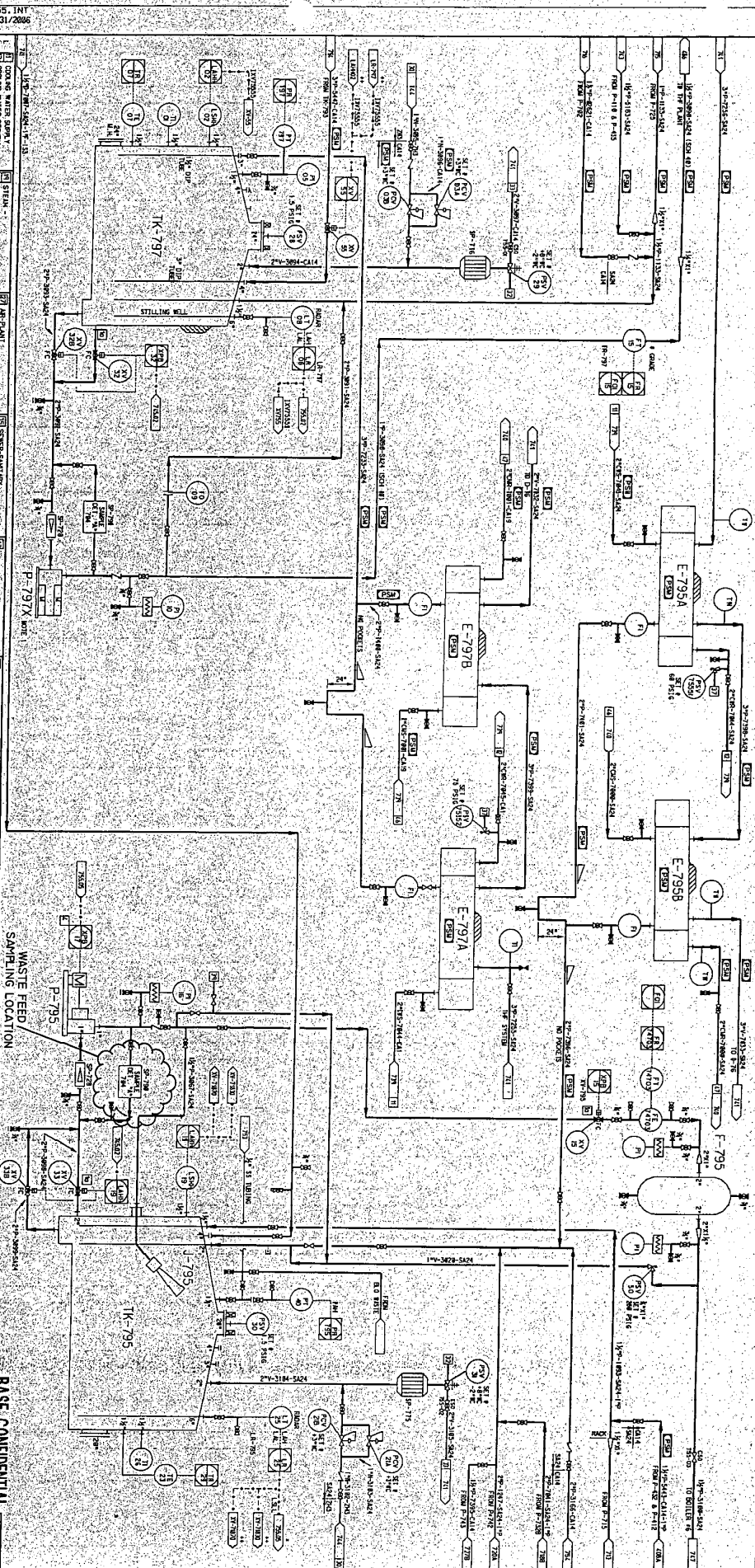




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 Modification base: H-10440-01-0000 (Control Design) 10/09/2008  
 Revision: 1

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 MURPHY J4 05/31/2008

CAUTION  
 PLOTTED BY:  
 G0175UWMI002208280755, INT 05/31/2008 10:09:03 AM



ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	COOKING WATER	1	COOKING WATER	1	COOKING WATER
2	WATER-DEIONIZED	2	WATER-DEIONIZED	2	WATER-DEIONIZED
3	WATER-DEIONIZED	3	WATER-DEIONIZED	3	WATER-DEIONIZED
4	WATER-DEIONIZED	4	WATER-DEIONIZED	4	WATER-DEIONIZED
5	WATER-DEIONIZED	5	WATER-DEIONIZED	5	WATER-DEIONIZED
6	WATER-DEIONIZED	6	WATER-DEIONIZED	6	WATER-DEIONIZED
7	WATER-DEIONIZED	7	WATER-DEIONIZED	7	WATER-DEIONIZED
8	WATER-DEIONIZED	8	WATER-DEIONIZED	8	WATER-DEIONIZED
9	WATER-DEIONIZED	9	WATER-DEIONIZED	9	WATER-DEIONIZED
10	WATER-DEIONIZED	10	WATER-DEIONIZED	10	WATER-DEIONIZED

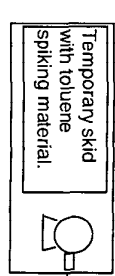
ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	COOKING WATER	1	COOKING WATER	1	COOKING WATER
2	WATER-DEIONIZED	2	WATER-DEIONIZED	2	WATER-DEIONIZED
3	WATER-DEIONIZED	3	WATER-DEIONIZED	3	WATER-DEIONIZED
4	WATER-DEIONIZED	4	WATER-DEIONIZED	4	WATER-DEIONIZED
5	WATER-DEIONIZED	5	WATER-DEIONIZED	5	WATER-DEIONIZED
6	WATER-DEIONIZED	6	WATER-DEIONIZED	6	WATER-DEIONIZED
7	WATER-DEIONIZED	7	WATER-DEIONIZED	7	WATER-DEIONIZED
8	WATER-DEIONIZED	8	WATER-DEIONIZED	8	WATER-DEIONIZED
9	WATER-DEIONIZED	9	WATER-DEIONIZED	9	WATER-DEIONIZED
10	WATER-DEIONIZED	10	WATER-DEIONIZED	10	WATER-DEIONIZED

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	COOKING WATER	1	COOKING WATER	1	COOKING WATER
2	WATER-DEIONIZED	2	WATER-DEIONIZED	2	WATER-DEIONIZED
3	WATER-DEIONIZED	3	WATER-DEIONIZED	3	WATER-DEIONIZED
4	WATER-DEIONIZED	4	WATER-DEIONIZED	4	WATER-DEIONIZED
5	WATER-DEIONIZED	5	WATER-DEIONIZED	5	WATER-DEIONIZED
6	WATER-DEIONIZED	6	WATER-DEIONIZED	6	WATER-DEIONIZED
7	WATER-DEIONIZED	7	WATER-DEIONIZED	7	WATER-DEIONIZED
8	WATER-DEIONIZED	8	WATER-DEIONIZED	8	WATER-DEIONIZED
9	WATER-DEIONIZED	9	WATER-DEIONIZED	9	WATER-DEIONIZED
10	WATER-DEIONIZED	10	WATER-DEIONIZED	10	WATER-DEIONIZED

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	COOKING WATER	1	COOKING WATER	1	COOKING WATER
2	WATER-DEIONIZED	2	WATER-DEIONIZED	2	WATER-DEIONIZED
3	WATER-DEIONIZED	3	WATER-DEIONIZED	3	WATER-DEIONIZED
4	WATER-DEIONIZED	4	WATER-DEIONIZED	4	WATER-DEIONIZED
5	WATER-DEIONIZED	5	WATER-DEIONIZED	5	WATER-DEIONIZED
6	WATER-DEIONIZED	6	WATER-DEIONIZED	6	WATER-DEIONIZED
7	WATER-DEIONIZED	7	WATER-DEIONIZED	7	WATER-DEIONIZED
8	WATER-DEIONIZED	8	WATER-DEIONIZED	8	WATER-DEIONIZED
9	WATER-DEIONIZED	9	WATER-DEIONIZED	9	WATER-DEIONIZED
10	WATER-DEIONIZED	10	WATER-DEIONIZED	10	WATER-DEIONIZED

BASE CONFIDENTIAL 6-23166

Flow Diagram  
 6894-02-755  
 075-41-42-440-755



**A8-BUILT PAID**

ID	DESCRIPTION
	ADDITIONAL INFORMATION

